

Problems of Resettlement on
SAIPAN, TINIAN, and ROTA
MARIANA ISLANDS

Coordinated Investigation of
Micronesian Anthropology
1947-1949

FINAL REPORT of Neal M. Bowers

Pacific Science Board
National Research Council
N7-onr-291: T O IV & Viking Fund Inc

by
Neal M. Bowers

COORDINATED INVESTIGATION OF MICRONESIAN ANTHROPOLOGY

operates with financial assistance from
Contract N7-onr-291, Task Order IV
between

THE OFFICE OF NAVAL RESEARCH

and

THE NATIONAL ACADEMY OF SCIENCES

CIMA field work was conducted in Guam and in islands of the Trust Territory in Micronesia (1947-49) with transportation and facilities contributed by the Navy Department. Studies in anthropology as well as human and economic geography were carried out in cooperation with universities, museums, and research institutions under this project of the Pacific Science Board of the National Research Council, aided by financial assistance from the Viking Fund and other private sources.

CIMA Report No. 31

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ACKNOWLEDGMENT

Many individuals have contributed to this study. Appreciation is due first to the Pacific Science Board of the National Research Council for a grant of funds permitting field work and to the Navy for services, equipment, and transportation in the area. Without the aid of these two organizations, the study would have been impossible. In particular, I wish to thank Dr. Harold J. Coolidge, Executive Secretary of the Pacific Science Board, Washington; Miss Ernestine Akers, Secretary of the Pacific Science Board, Honolulu; Mr. Edwin H. Bryan of the Southwest Pacific Commission, Honolulu; Admiral Carleton Wright, formerly Deputy High Commissioner of the Trust Territory; Admiral Leon Fiske, Deputy High Commissioner of the Trust Territory; Rear Admiral George L. Compo, formerly Governor of the Northern Marianas; Captain W. F. Jennings, formerly Chief, Island Government Unit, Washington; Commander Lee Duke, Island Government Unit, Washington; Commander Gordon Findley, Island Government Unit, Honolulu; Commander Ralph Wilhelm, formerly Civil Administrator on Saipan; and Commander S. T. Dibrell, Chief, Map and Photo Unit, Office of Naval Intelligence, Washington. These persons and their associated staffs gave aid and information throughout the progress of the study. Special privileges were granted the writer at the Libraries of the University of Michigan and the University of Hawaii, at the Library of Congress, at the Bernice P. Bishop Museum in Honolulu, and at government agencies in Washington, Hawaii, Guam, and Saipan. Thanks are due many persons among the Chamorro and Carolinian peoples of the Marianas for cooperation in supplying information and invitations to join in their activities. Dr. Charles M. Davis, Professor of Geography at the University of Michigan, aided in a number of ways. My debt is particularly heavy to Dr. Robert B. Hall, professor of Geography at the University of Michigan. His personal interest and many suggestions proved a constant source of inspiration.

October 30, 1950

Neal M. Rowers
Ann Arbor, Michigan

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CHAPTER I

Introduction - *The Area Problem*

The native peoples of Saipan, Tinian, and Rota are facing a crisis marking the dividing line between subsistence and the reattainment of their former standard of living. Their environment, laid waste by the war, must be reworked with human purpose. This presents a geographic problem in the evaluation of resources and the focusing of activities for their development. The people must be educated to the potentialities of their area if a firm economic structure is to be established. Many of the problems encountered are deeply rooted in the geographical and historical background of the area; others arise directly from the destruction wrought by the war.

Since foreign political control was established over the Mariana Islands about three hundred years ago, the impact of foreign cultures has modified the aboriginal patterns until, under the Japanese, the natives came to live in a full money economy. For the most part, the islanders were bystanders in the transformation which changed their environment from one of forest and subsistent farms to a colonial area of sugar plantations. The initiative and energies which brought this change were supplied by the Japanese, but the natives benefited in consequence reaching a standard of living higher than that achieved under any previous ruling power. Crossed by the Pacific battle lines of World War II, the islands were assaulted and occupied by American troops. The attainment of victory uprooted and displaced the population, destroyed the tools of production, and broke the established economy, setting the area back at least a quarter of a century. Under Military Government and then Civil Administration, the United States Navy met the immediate needs of the populace and began the work of rehabilitation. Eventually the Japanese were repatriated, and the natives were left in a war-torn environment with neither the experience nor the background to reconstruct their former manner of life. A responsibility rests with the United States, now in control of the area under trusteeship from the United Nations, to aid the people by directing their efforts towards the full development of the area for the benefit of the local inhabitants.

One of the primary objectives to which American administration is committed in the area is the reestablishment of the former level of living on as self-supporting a basis as the local resources will permit. This is a problem important not only to the well-being of the islanders but also to the American taxpayer and to the United States as trustee under the United Nations. The work which follows attempts to analyze the problem in terms of the present and the past, to evaluate the resources and the techniques of production, and, when possible, to make recommendations which may help in the coordination of human activities within the region for the benefit of the people as a whole. The study presents the geographic and historic background of the problem, the origin of the problem as it arose from the war, some of

the aspects of the problem as related to the resettlement and occupational use of the land, and, in conclusion, an appraisal of the future.

As a part of Japanese Mandated Micronesia, the Northern Marianas were closed to practically all travel and scientific work by non-Japanese, and, as a result, there is a paucity of materials in Western sources on the area for the period between 1914 and 1944. Earlier Spanish and German materials are also limited, a condition reflecting the general lack of interest in the islands during the regimes of these two nations. The American assault on the islands destroyed the local land and statistical records, as well as most of the materials relating to research in agriculture and other occupational uses of the land filed in government and private commercial offices. This destruction has been a distinct loss to Civil Administration and to scientists interested in the area. It is sincerely hoped that this study will add to the information on the Marianas and be of aid to administrators in the area and to the several government agencies in Washington and Honolulu interested in the Trust Territory of the Pacific Islands.

CHAPTER II

Time, Space, and Man - *The Background of the Problem*

The Marianas are a new land. Measured against the world time scale, they are recent in geologic origin, recent in occupation by plants and animals, and recent in utilization by man. Measured against world totals, the islands are microscopic in total area, in population, and in resources. In terms of human values, however, they rank high, having become, along with the entire Trust Territory, a testing ground for American policy in action.

The islands lie south-southeastward of Japan, occupying the southern portion of a chain extending from the Izu Peninsula through Guam to the Santa Rosa Banks. (Fig. 1).¹ All are high islands, part of a series of arcs which can be traced across the Pacific from the Aleutians to New Zealand.² Occupied late in the history of Pacific migrations, they were also late in being drawn into the overlapping and interacting land, population, and industrial expansion of Western Europe following the period of great discoveries. During the some four hundred years that these islands have been known to Western man, they have been ruled wholly or in part by the Spanish, the Germans, the Japanese, and the Americans. Each new administration brought cultural conflict, varying policies affecting the natives, changing methods of land utilization, and consequent changes in economy.

During the war, the various islands in the Marianas were captured or bypassed by the United States in the stepping-stone fighting towards Japan. Some of the larger ones, such as Saipan and Tinian, were developed as staging areas to be used in the final attack against the enemy. The precipitous end of the conflict, following the atomic bombing of Hiroshima and Nagasaki, left the islands unused for their intended purpose, but they still remain of crucial strategic value to the United States. Location gives them an important place in the spatial relations of global geography. Flight technology may some day obviate the need for stopping points along Pacific air routes; but, at present, over an ocean of such vast distances, and one in which the total land area is relatively small, the islands, their location, and their geographic character determine the routes followed in commercial and military flying. Just as the islands were important to Japan as an outer line of defense, so they are equally important to the United States as

¹The Marianas are located between 13° 14' and 20° 33' North Latitude and 144° 54' and 156° 05' East Longitude.

²Aleutians, Kuriles, Japan, the Izu Islands, Bonins, Volcano Islands, Marianas, Yap, Palau, Admiralty Islands, Bismarck, and Solomon Islands, the New Hebrides, Fiji, Tonga, the Kermadecs, and New Zealand.

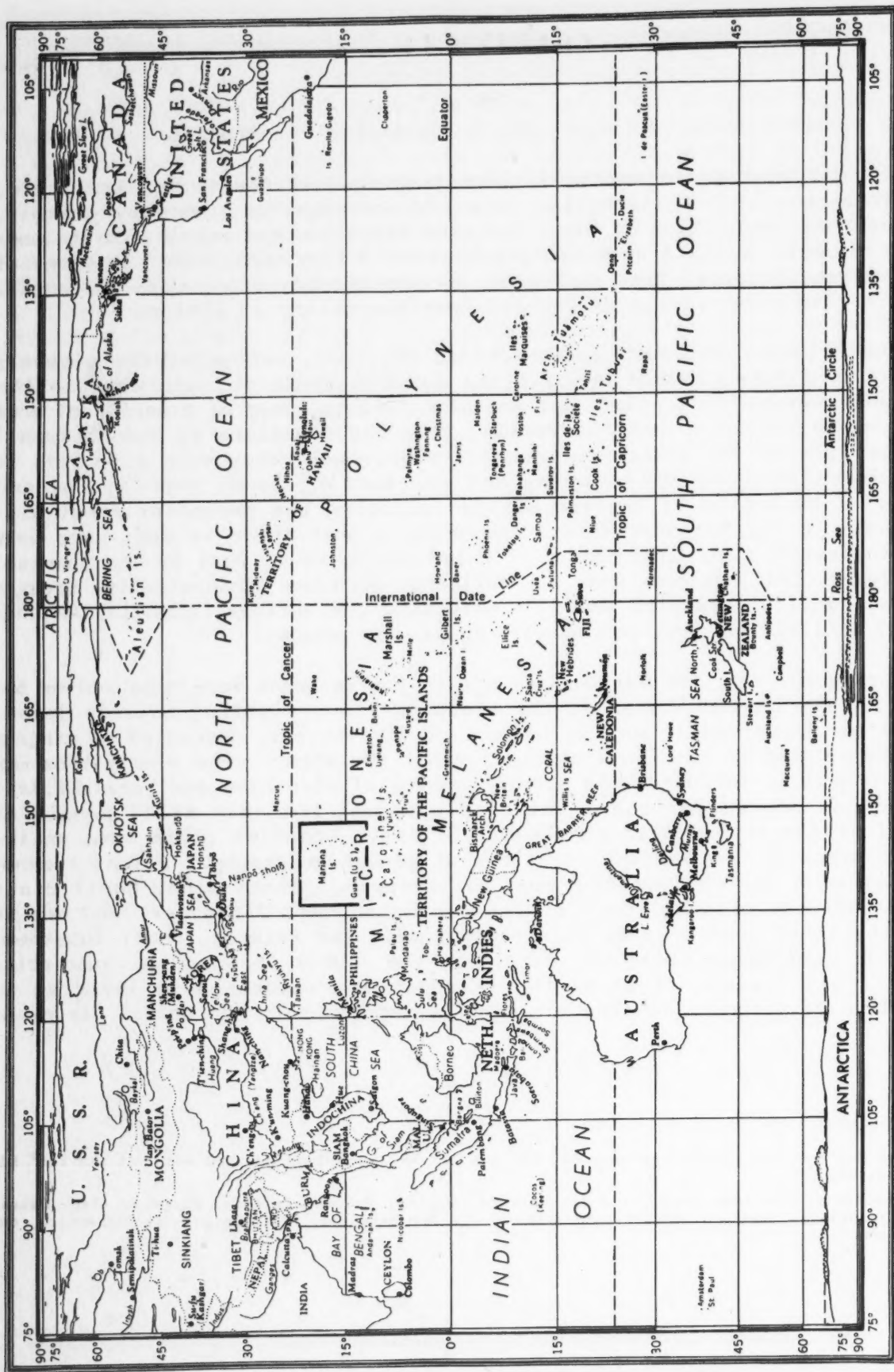


FIG. 1. Locational Map

a barricade against attack.¹

No region is equal only to the sum of its parts, now can be understood except as it develops and functions as a segment of a greater totality. The Marianas are in part the product of physical and human forces arising from outside the area, and the islands, in turn, have currents of influence entering the surrounding world. Tectonic forces which gave birth to the islands arose from distant centers of pressure, and the lifting of the arc gives isostatic balance with other regions. The inhabitants have sent their products into world markets and bought other produce in return. Both the Occident and the Orient have touched the Marianas, bringing them into a world of foreign trade and dependence. As a result, the solution of their present problems is both local and worldwide.

For purposes of this study only the Marianas within the Trust Territory are under consideration, and more specifically Saipan, Tinian, and Rota. These three underwent the greatest change of landscape as a result of the conflict and today support the largest population concentrations. They cannot, however, be fully separated from the Mariana chain for isolated study since they are bound to the whole in history, culture, and geography. Likewise, the economic future of these islands is dependent upon the development of the island arc as a whole.

Distribution and Area of the Islands

The seventeen islands in the Marianas, three of which make up the island cluster Maug, extend over a north-south distance of about 440 miles. (Fig. 2). Because of their linear arrangement, the water area associated with the Marianas as a geographic region is small as compared with that of Micronesian island groups of scattered pattern.² All the Mariana islands are diminutive in size; Guam, the largest, is also the greatest between Hawaii and the Philippines. The total land area of the entire Mariana arc is 399.11 square miles. The islands are arranged along two lines which, if extended, would parallel each other. Along the western line, and making up the northern portion of the chain, are nine small islands.³ The southern islands, located along the eastern line, are larger, the five southern most having an area equal to about five-sixths that of the entire group, while Guam is larger than all the other islands combined (Table 1).

¹Military strategists emphasize the need for island bases primarily to serve as bases for radar stations, and the advance-guard interception of guided missiles.

²The water area associated geographically with the Marianas is approximately 22,000 square miles as compared with 1,445,900 square miles for the Marshalls.

³The three islets of Maug are counted as a single cluster.

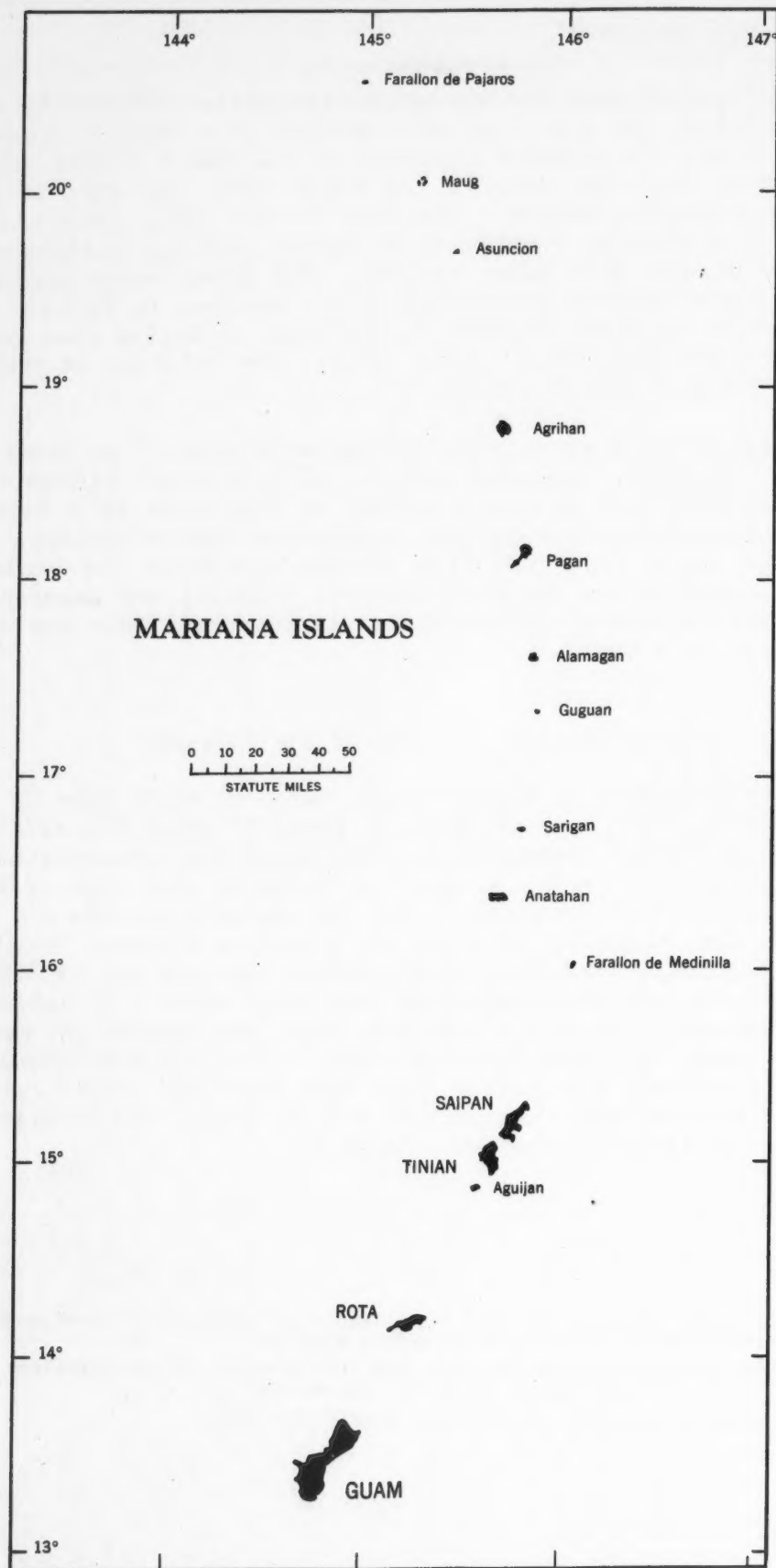


FIG. 2

TABLE 1
ISLANDS OF THE MARIANA CHAIN^a

Name	Dimensions (Miles)	Area (Sq. Miles)	Peak Elevation (Ft. above Sea Level)
Farallon de Pajaros	0.8 (diameter)	0.79	1,047
Maug			
East Island....	1 x 0.5	0.36	709
West Island....	1.75 x 0.25	0.26	591
North Island...	0.75 x 0.25	0.18	748
Asuncion.....	1.6 (diameter)	2.82	2,923
Agrihan.....	4.0 (diameter)	18.29	3,166
Pagan.....	8.7 x 3.5	18.65	1,883
Alamagan.....	2.0 (diameter)	4.35	2,441
Guguan.....	1.5 x 1	1.61	988
Sarigan.....	1.7 (diameter)	1.93	1,801
Anatahan.....	5 x 2	12.48	3,585
Farallon de			
Medinilla.....	1.5 x 0.25	0.35	266
Saipan.....	12.7 x 5.5	46.58	1,554
Tinian.....	10.5 x 5	39.29	564
Aguijan.....	2.5 x 1	2.77	584
Rota.....	10.5 x 3	32.90	1,612
Guam.....	32 x 4 x 8	215.50	1,334
Total Marianas		399.11	
Total, less Guam		183.61	

^aThe islands are listed in order as they occur from north to south. Data from Edwin H. Bryan, Jr., *Geographic Summary and Notes on Climate*, Vol. II, Part I, *An Economic Survey of Micronesia* (Honolulu: United States Commercial Company, 1946) pp. 14-28 (Typescript, Library of Congress Microfilm).

Structure and Surface

The Marianas are arranged along a rising range, lifted upward by tectonic forces resulting from the subsidence of the Pacific Basin. The slight curvature of the arc, as well as the geomorphology of the islands, indicates that the Marianas are youthful, probably dating from the Eocene.¹ Geologically the islands fall into two regions, a younger chain of small purely volcanic islands extending from Anatahan northward, and an older, more complex group

¹Much of the material for this section has been drawn from the writings of Risaburo Tayama, who has worked more extensively in the Marianas than any other geologist.

consisting of the six southern islands (Fig. 3). The northern islands are so little eroded as to still retain their initial volcanic form, and among them Guguan, Pagan, Agrihan, Asuncion, and Farallon de Pajaros are active at present or have been so within the period since 1905. Although the submarine slope of these islands agrees generally with the aerial one, the inclination is high on the west side of the three northernmost islands and contrarywise in the others, due perhaps to differential tipping. Sea cliff and insular shelf are well defined on the northern islands at about the 650 foot contour. Tayama postulates that there has been no recent upheaval or submergence. Reef is only slightly developed, the waters here being cooler than at the southern end of the chain.

The islands southward of Anatahan are volcanic in base, coral capped, and the result of more prolonged evolution. Here, atop the anticline, the island bases are formed of andesitic lava, agglomerate, and ash (Table 2).¹ These consolidated under the weight of a second volcanic deposition.² During periods of submergence, coral was deposited over the islands; the most extensive of the resulting beds are the massive and porous Tapotchau and Mariana limestones, widely distributed in the southern Marianas (Fig. 4). Subsequent uplift raised the coral, in some cases to heights of 1,554 feet, as on Mt. Tapotchau, Saipan. During quiescent periods, wave action, especially along the windward eastern coasts, has cut the slope into terraces, giving the islands a stair-step appearance. Subsequent faulting has somewhat modified this original structure, and erosion has produced a youthful karst topography with sinkholes, caves, and a few disappearing intermittent streams. The submarine slopes of the southern Marianas are steeper on the eastern side, a condition resulting in an asymmetrical distribution of reef. Barrier reefs³ tend to develop on the more gentle western slopes, while reefs closely fringe the shores on the east (Fig. 3). A few drowned valleys occur on the east coast of Saipan and the southeast coast of Guam. The coasts of the islands are generally rocky and cliff-bound and characterized by wave-cut notches, sea caves, abrasion benches, and detached segments of the former shore.

The underlying structure of the Marianas presents a number of challenging questions related to the formation of mountain arcs, both continental and

¹The best exposures of this rock (Hagman Andesite) are to be seen on the eastern coast of Hagman Peninsula on Saipan, but its occurrence is also to be noted at Mt. Laulau, Mt. Finasusu, and Mt. Denshinyama, all three of which are regarded by Tayama as probable ancient craters.

²The second period of volcanic flow on Saipan gave rise to rocks now classified as Sankakuyama rhyolite.

³Barrier reef is most highly developed on Saipan and Guam, slightly on Tinian, and is almost absent from Rota.

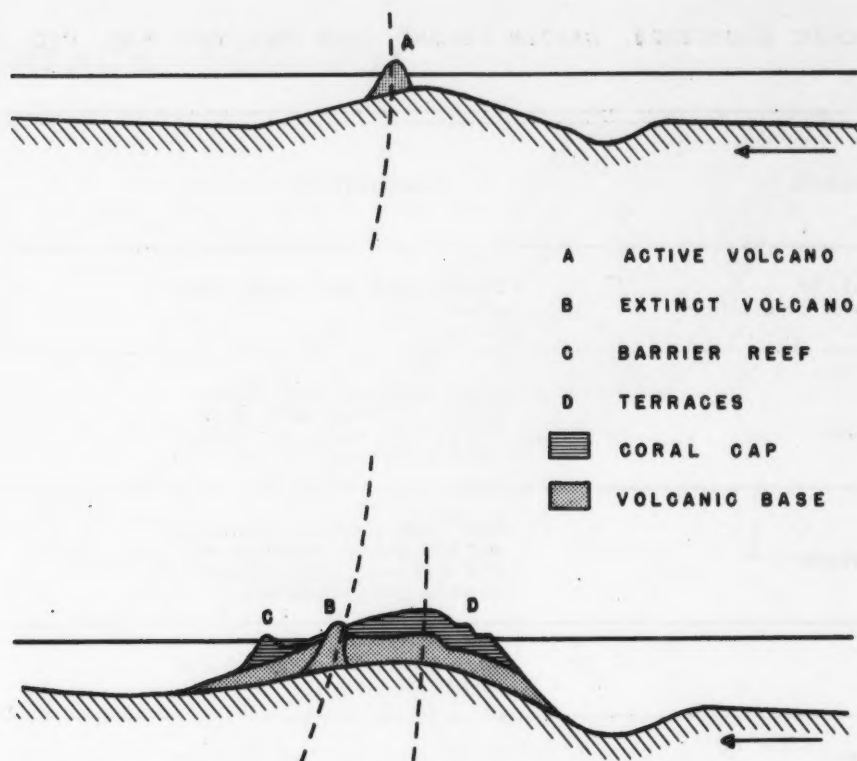


FIG. 3. Profile sections of the Mariana arc. The islands in the northern Marianas are small and purely volcanic in character while those in the south consist of volcanic bases covered with coral limestone. Note pronounced development of wave-cut terraces along windward east coasts and barrier reefs on the west where the submarine slopes are less abrupt (after Hobbs).

oceanic.¹ The work of the Japanese hydrographic office indicates the presence of three Mariana ridges, two of which result from the division of an arc which passes from the Izu Peninsula through the Volcano Islands (Kazan-retto) and forks at a point southward of Minami-io-jima (Fig. 5). The westernmost of these ridges extends directly south through Arakane Reef. The second ridge, which forms a base for the nine northern islands, curves in an arc, passing through the recently active Esmeralda submarine volcano and connecting with the first ridge at about 11° N. latitude, 140° E. longitude. The third ridge passes through the Bonins, and along its southern extent are arranged the larger Mariana Islands, on which the volcanoes are extinct.

¹ Are these arcs the result of pressure from single or multiple directions? Why do they occur along the western borders of the Pacific while the eastern shores, as well as those of most of the other oceans are arcless? Why are some arcs single and others double, and the inner arc frequently volcanic and the outer one not?

TABLE 2

GEOLOGIC STRUCTURE, SAIPAN ISLAND (SEE GEOLOGIC MAP, FIG. 4)^a

Name of Formation	Composition	Depth (Feet)
Recent Coral Uplift Raised Coral Reef Limestone	Loose sand and reef limestone	
Mariana Limestone	Hard emerged reef limestone covered with $\frac{1}{4}$ to 5 feet of soil and filled with cavities.	
Tapotchau Limestone	Reef and rubble limestone with a dense breccia at the bottom. The rubble is weakly consolidated.	500 1,000
Donne Beds	Thin bedded marine shale and marl.	
Laulau Limestone	Fine-grained, sandy limestone.	
Matansa Beds	Sandy limestone and marls.	1,500
Denshinyama Beds	Weakly consolidated pumiceous conglomerates, sandstones, and sandy shales containing boulders of andesite and pebbles of rhyolite and coral.	2,000 2,500
Sankakuyama Rhyolite	Fine-grained consolidated rhyolitic ash.	
	Consolidated rhyolitic explosive debris. Rhyolite (liparite) lava flows. Consolidated pumiceous deposits with some interbedded gravels. Andesitic lava flows.	3,000
Hagman Andesite	Coarse bouldery explosive deposits and tuffs. Heavy andesitic lava flows.	3,500 4,000

^aAdapted from Tayama.

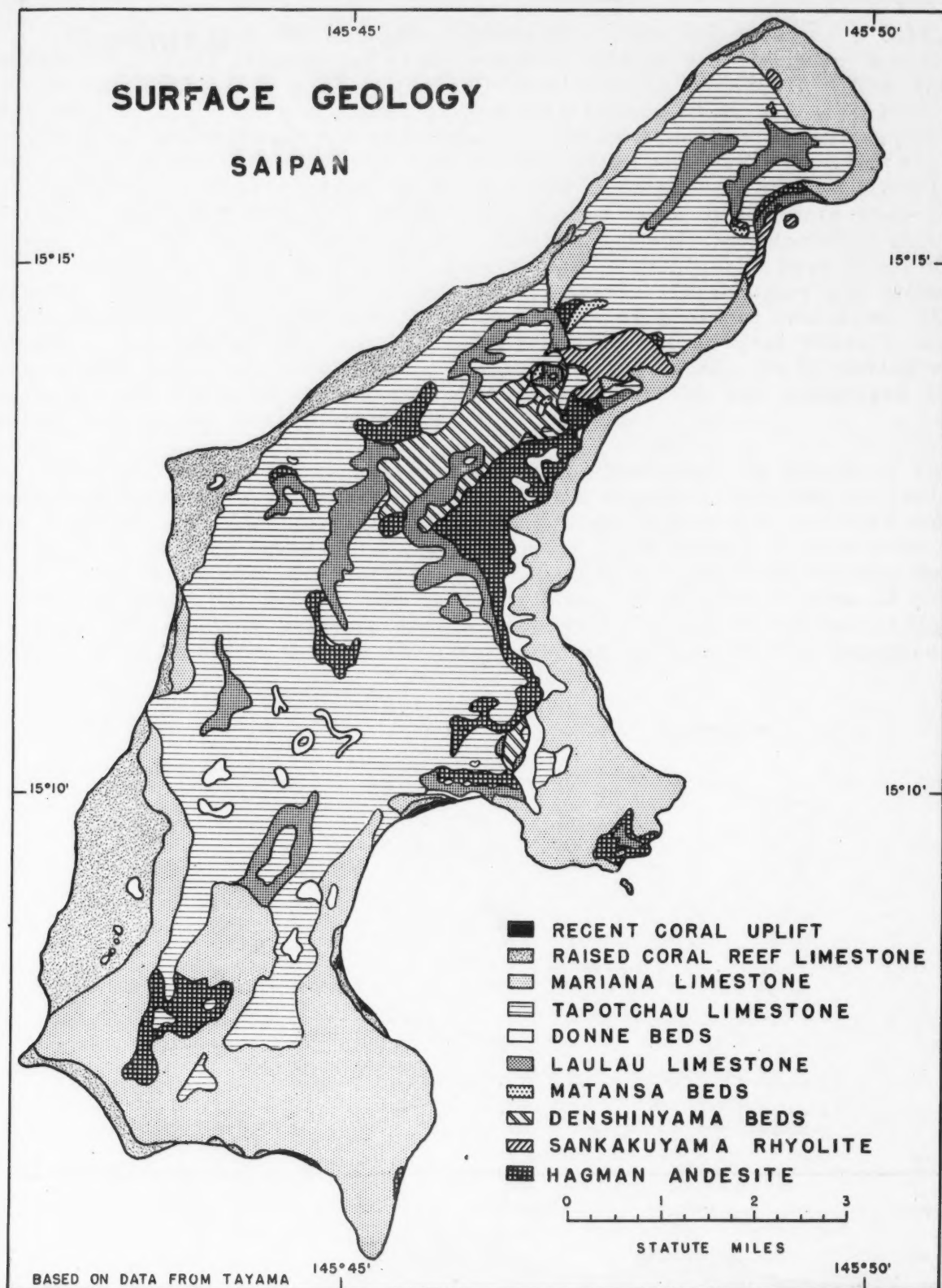


FIG. 4. The surface geology of Saipan, with a predominance of coral limestone and occasional outcropping of volcanic materials, is typical of the southern islands in the Marianas chain.

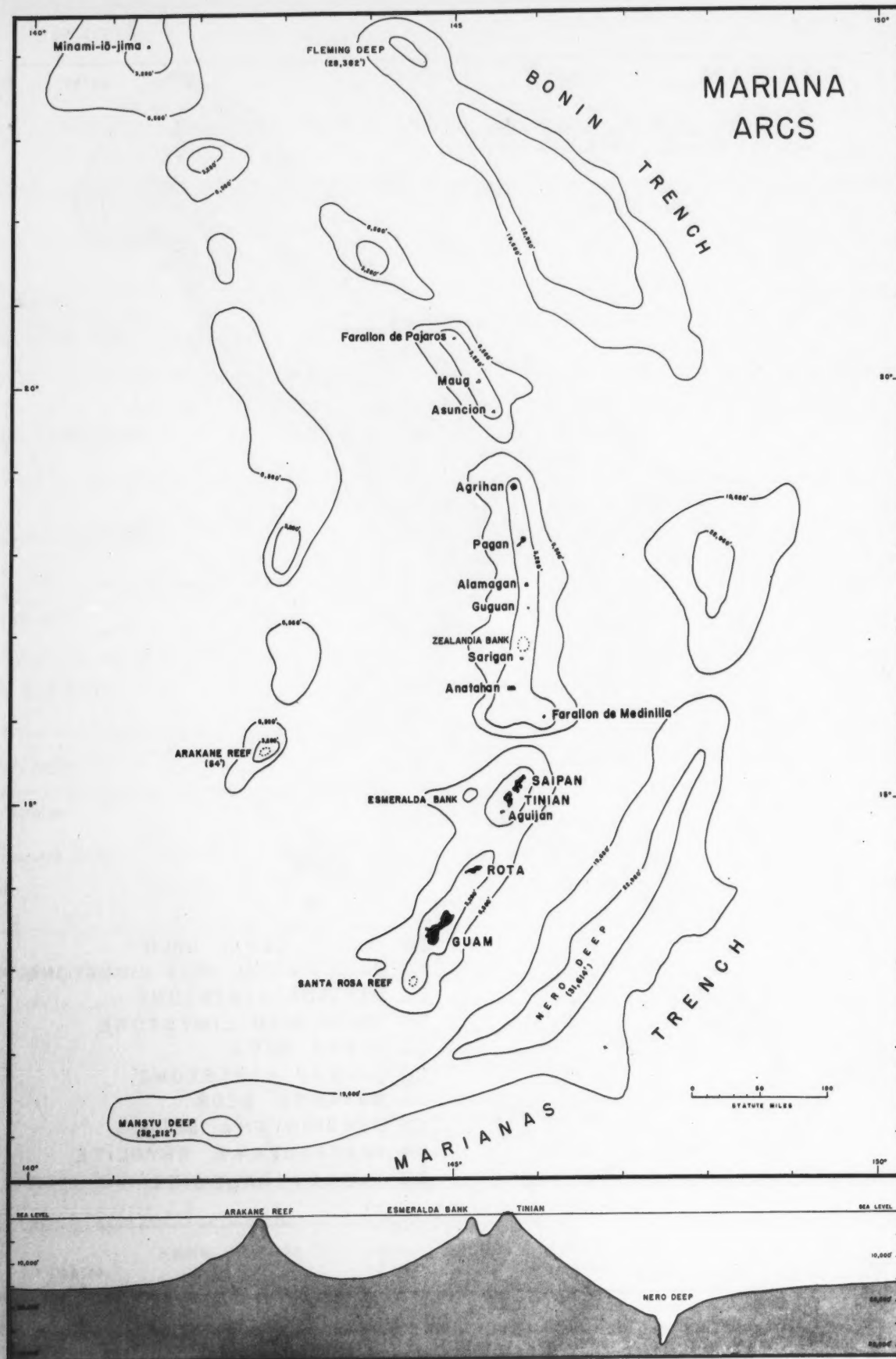


FIG. 5

It appears that the southern islands are along the crest of a fold, but whether the inner islands are along a second fold in echelon or on a volcanic ridge developed from a deep-seated shear line is uncertain. The latter possibility might have occurred as pressure increased on the anticline, resulting in underthrust of the basaltic ocean floor below the andesitic materials of the continental area within which the Marianas lie (Fig. 6). The geographic distribution of deep-focus earthquake centers around the Pacific, landward from the island arcs, would seem to indicate that these shear lines are highly developed and penetrate deeply. Associated with the outer anticlinal fold is a great geosynclinal trough, the Nero Deep, which reaches a depth of nearly six miles (31,614 feet). Earthquakes and vulcanism indicate that the Marianas are still in a stage of geologic evolution. Slight shocks, registering only on the seismograph, occur several times a month, but severe shakes are infrequent. Volcanic action appears to be moving westward across the ridges, and it is possible that the now submerged inner ridge may become active at some future period.

Saipan, the second largest island in the Marianas, is formed of raised coral terraces on a volcanic base, the whole somewhat deformed by faulting and tilting. Thirteen terraces arranged on eight planes are distinguishable, although only five levels stand out sharply. The island divides into five surface regions: (1) the northern terrace, (2) a rugged mountainous upland occupying about one-fourth the island's area, (3) Kagman Peninsula on the east, (4) the southern plateau, and (5) a coastal lowland on the west (Fig. 7). The level surface of the northern terrace, early used by the Japanese for

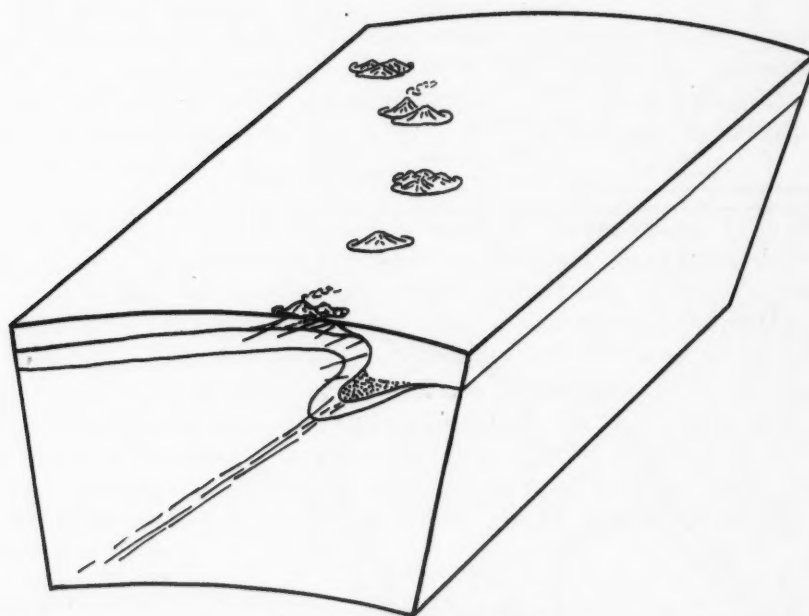


FIG. 6. Schematic block diagram of an island arc of the Marianas type showing the volcanic core, the deep sea trough, the supposed underthrusting of the basaltic crust of the Pacific ocean floor near the andesite line, and the potential zone of shear (as postulated by Umbgrove).

SURFACE REGIONS

0 1 2 3 4
STATUTE MILES

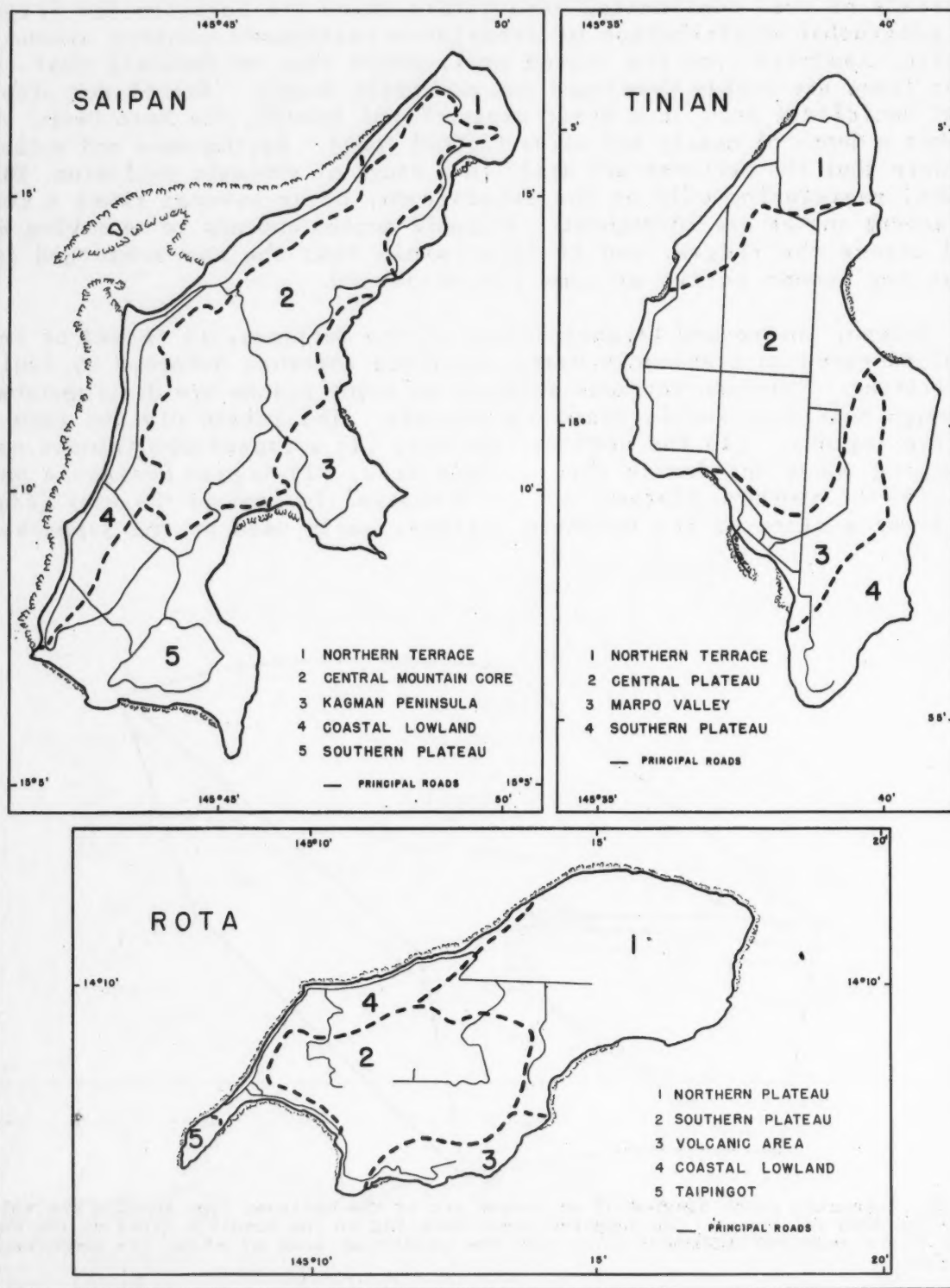


FIG. 7

sugar plantings, is marked by cliffs on the seaward side. Interiorward, the terrace merges with the mountain core, the surface rising through cliffs, terraces, and hilly terrain to a flattened ridge 600 to 800 feet in elevation. Above the crest and dominating the skyline are four peaks: Marpi (peak), Mt. Petosukara, Mt. Atchugau, and Mt. Tapotchau (Fig. 8). The latter, the highest of the four, is located in almost the exact mathematical center of the island and rises to a narrow ridge 1,554 feet in elevation. Low saddles give access from one side of the island to the other over the mountain axis. Kagman Peninsula, extending eastward from the central eastern coast, has an arched surface level to rolling in character and terminates on the east in a cliffed ridge which drops abruptly to the sea. The southern plateau ascends through three major levels to a high point (360 feet) on Naftan Peninsula on the extreme southeast. This is the most extensive area of near-level agricultural land on Saipan, now occupied in large part by airfields and abandoned military installations. Extending along the southern two-thirds of the western coast is a narrow lowland fronted by a barrier reef about a mile and a quarter offshore at its most distant point. The wider southern portion of the plain contains small, brackish Lake Susupe and a surrounding area of marsh.¹

Tinian is composed of two plateaus separated from each other by a medial valley with a NE-SW axis (Fig. 7). Each plateau is divided into several minor blocks. Nine terrace levels stair-step the surface between the generally cliffed coast and the upper plateau, making a total of ten levels including the upper surface. The terraces are well developed, giving Tinian a higher percentage of level land than either Saipan or Rota. All elevations are under 600 feet; Mount Lasso, the highest, rises to 564 feet on the central plateau. The northern end of the island is characterized by a terrace similar to that of northern Saipan.

The small island of Aguijan, located southwestward from Tinian, is distinctly terraced in six steps, of which the fifth entirely surrounds the island. Landing is difficult because of the fringing reefs, and ascent to the upper levels arduous due to cliffs. The Japanese, however, cultivated the small uppermost plain.

The terraces of Rota are distinctly marked indicating five major periods of terrace formation. Five physiographic regions characterize the island: (1) a northern tableland of about 450 feet elevation, (2) a southern plateau of 1500 feet elevation, known as the Sabana, (3) a southeastern volcanic area, and (4) a northwestern lowland plain linked by an isthmus with (5) Taipingot, a 469 foot terraced rock which at one time probably existed as a separate island (Fig. 9). The volcanic region is eroded into ridges and valleys; the uplands are covered with sword grass (*Miscanthus floridulus*) and the valleys marked with tree growth. This is the only portion of the three islands crossed by permanent streams. These have their sources along the line of

¹Several Chamorros stated that in island tradition Lake Susupe was a volcanic crater, but there is no surface evidence of this. Rather, it appears that Lake Susupe and its surrounding marsh area is the unfilled portion of an uplifted lagoon.

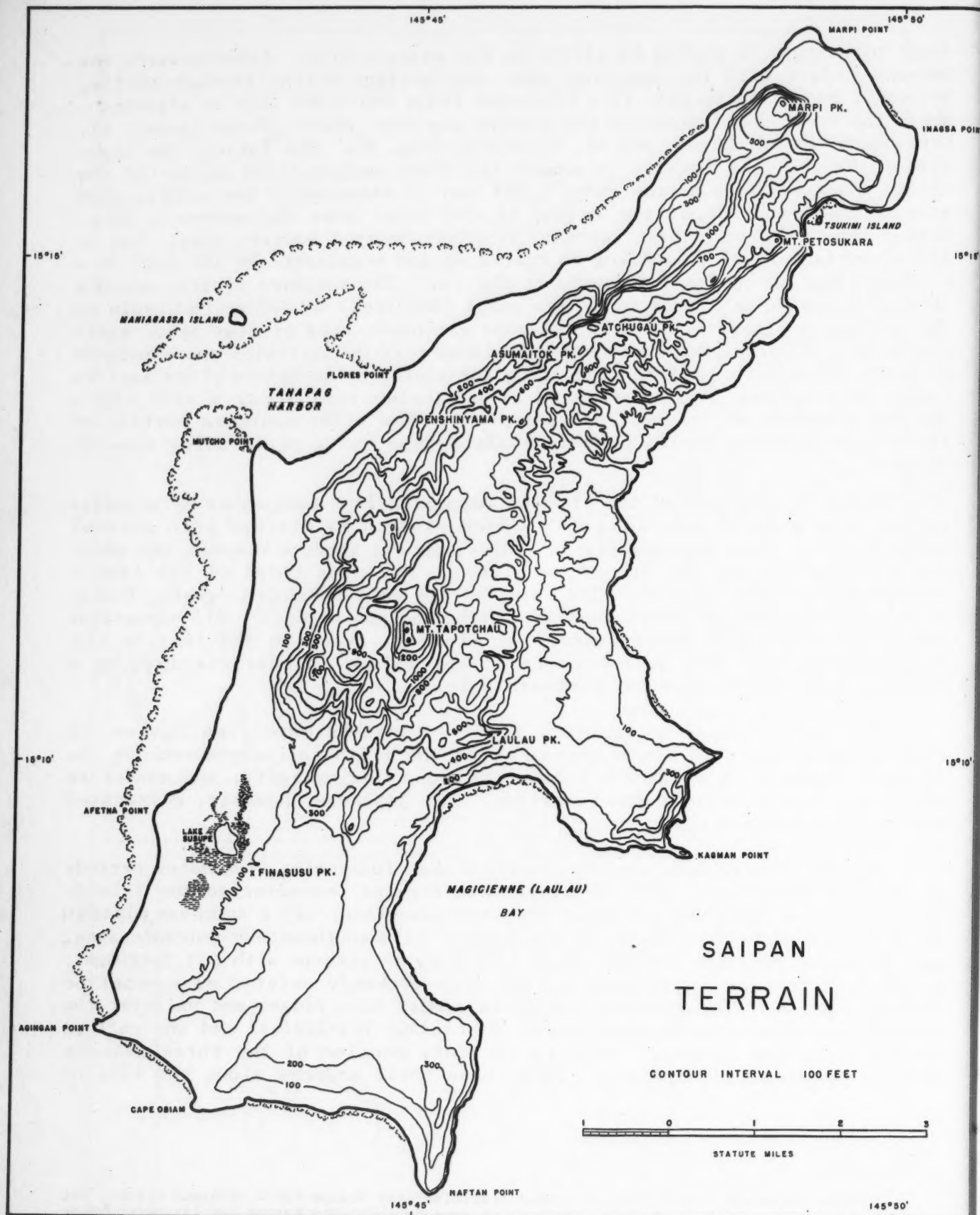


FIG. 8



FIG. 9. Rota: Emerged marine terraces of Taipingot, formerly an island but now attached to Rota proper by an isthmus. View from the east across Sosanjaya Bay.

contact with andesitic rock at the base of the limestone cliffs marking the edge of the southern plateau, the upper plateau level serving as a catchment basin. Peak elevation on Rota is Mt. Manira (1,625 feet), on the southern plateau; because of gentle slope, it does not stand out sharply above the surface. On the south, the upper plateau is bordered by precipitous cliffs which drop through narrow terraces to the water.

Climate

The climate of the Marianas is tropical marine, reflecting the nearness of the thermal equator and the influence of the warm surrounding waters.¹ Wind and rainfall are the most variable elements; humidity, temperature, and pressure remain fairly constant throughout the year. In the summer, the tropical front lies near or over the southern Marianas and equatorial air masses invade the area, bringing increased temperatures and higher humidity. In the winter, equatorial air continues to invade the area, but polar continental air masses occasionally move into the region from the Asiatic high pressure area. These are much modified by the time they reach the Marianas but bring reduced temperatures, greater precipitation, and increased cloudiness.

¹Garapan, Saipan is classified climatically as Afi according to the Koppen system.

Climatically the year falls into two seasons with very little temperature variation but pronounced rainfall differences (Fig. 10). Average temperature for Saipan, Tinian, and Rota is 81.5°F. Annual range is small, about 4°F.; diurnal range averages 9° F. to 10° F., but may be large enough in January or February to result in a feeling of coolness (Table 3). Extreme minimum temperatures of 68° F. have been recorded at Garapan on Saipan; the extreme maximum, recorded at the same station, is 89° F.¹

Precipitation is abundant, approximating 79.5 inches a year for the entire area. Saipan averages 83.1 inches annually; Tinian, being less elevated, 72.2 inches.² Rain falls on an average of 216 days a year. The period of heaviest fall occurs during the four months of July, August, September, and October; 56 percent of the precipitation commonly falls within this period. The ratio between the driest and wettest months of the year is 1 to 5; the dry season is of sufficient intensity to retard the growth of vegetation. Recorded annual rainfall extremes range from 115.1 inches to 59.8 inches, as observed over a period of nineteen years at Garapan. Deviation is sometimes so great as to result in crop damage. The rainfall of the Marianas is of two types: orographic, dominant throughout the winter season of the northeast trades, and convectional, occurring with greatest frequency during the summer, when warm, moist, unstable air invades the area from the south.

Relative humidity is high, averaging 83 per cent for Saipan, but almost constant breezes give a comfortable sensible temperature. The period of greatest humidity is from July to October, while the least humid months are January, February, March, and April.

The Marianas lie along the fringe of the area under Asiatic monsoonal influence. In the winter the winds blowing outward from Asia are deflected so that they combine with and accentuate the northeast trades over the area (Fig. 11). In the summer, under the influence of air moving into the Asiatic low pressure, the winds tend to shift to the east and southeast (Fig. 12). Prevailing winds over the islands are northeast, but reporting stations, all of which are located on west coasts, often show a predominance of east winds due to surface deflection. Average annual wind velocity is 10.5 miles per hour (Beaufort 3).

The months from August to mid-September are the most subject to storms. Since September, 1945, nineteen tropical storms, some of typhoon force, have affected the Marianas.³ Three of these were of such velocity as to result in considerable destruction on some of the islands; the others passed close enough to the arc to bring strong winds, high seas, and heavy precipitation. (Appendix A.)

¹Data are from the United States Weather Bureau. Climatic records for the islands are inadequate and cover only short periods. All reporting stations were in lowland, west coast locations.

²No climatic data are available for Rota.

³Data from the Fleet Weather Central and Navy Typhoon Tracking Center on Guam.

STATION **GARAPAN,**
SAIPAN, MARIANA ISLANDS

LATITUDE **15°12'15" N.**

LONGITUDE **145°43'15" E.**

ALTITUDE **10 FT.**

MEAN ANNUAL TEMPERATURE **78.3° F.**

MEAN ANNUAL PRECIPITATION **82.2 INCHES**

MEAN ANNUAL RANGE OF TEMPERATURE **3.9° F.**

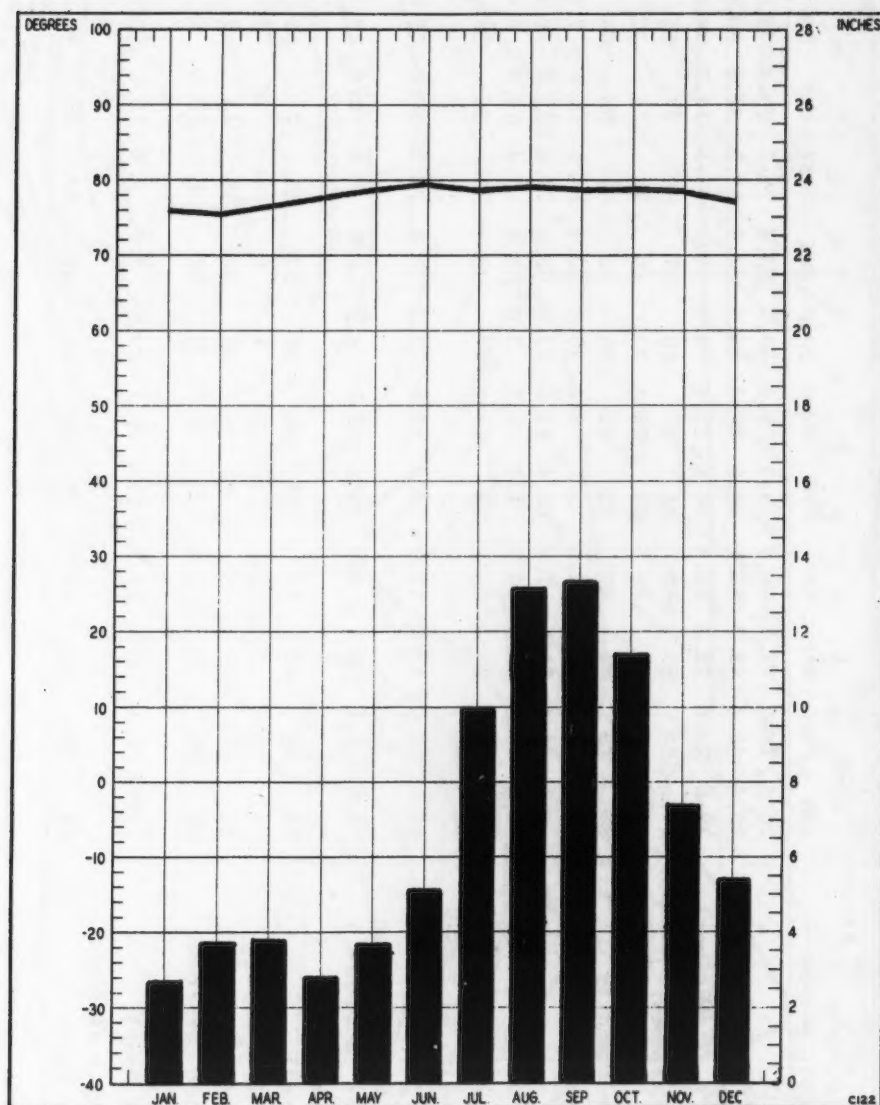


FIG. 10. Climatic Graph, Garapan, Saipan.

TABLE 3

CLIMATIC DATA, GARAPAN, SAIPAN^a

Garapan, Saipan	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Range	Annual	Years of Record
Temperature	76.4	76.0	77.0	78.2	79.1	79.9	79.1	79.4	79.0	79.1	78.8	77.8	3.9	78.3	6
Temperature Means: (Maximum)	80.4	80.4	81.7	82.9	83.7	84.4	83.5	83.8	83.5	83.5	82.8	81.7	4	82.8	6
(Minimum)	72.3	71.6	72.3	73.4	74.5	75.4	74.7	75.0	74.5	74.7	74.7	73.8	3.8	73.9	6
Temperature Extremes: (Maximum)	84	85	85	86	87	87	88	87	89	87	85	84		89	6
(Minimum)	68	69	68	71	69	71	71	69	71	71	72	70		68	6
Mean Relative Humidity	80	79	81	80	82	81	86	85	86	86	84	82		83	6
Precipitation	2.6	3.6	3.8	2.8	3.7	5.1	10.0	13.1	13.3	11.4	7.4	5.4		82.2	19
Precipitation Extremes: (Maximum)	5.4	11.4	10.5	7.7	10.4	11.5	21.6	23.0	24.0	25.2	19.4	10.0		115.1	19
(Minimum)	0.6	0.8	0.8	0.6	1.3	1.2	3.6	3.6	7.4	4.3	3.4	1.5		59.8	19
Mean No. Days of Rain	22	18	21	18	23	23	27	26	27	26	25	23		279	6
No. of Days with .04 inches of Rain	15.0	12.2	13.6	11.8	15.2	14.6	22.2	21.6	22.8	19.8	19.0	17.0		204.8	5
Intensity of Precipitation (Max. inches in 24 hrs.)	1.4	2.1	6.1	2.8	5.3	3.7	8.2	8.9	5.4	6.1	13.1	3.0		13.1	19
Cloudiness (Percentage of Sky Covered)	70	68	62	57	64	60	78	80	81	71	66	61		68	6
Mean No. of Clear Days	1-	2	1	1	1-	1	1	1	1-	1-	1-	1		7	6
Mean No. of Cloudy Days	12	11	6	6	9	8	19	20	18	14	9	7		139	6
Prevailing Wind Direction	NE	NE	E	E	E	E	E	SE	E	E	E	E		E	S
Mean Velocity of Wind (Miles per hour)	11.9	10.3	11.0	10.7	12.1	10.1	10.1	8.3	8.3	10.1	12.1	12.3		10.5	6
Highest Velocity of Wind (Miles per hour)	31	31	32	31	28	30	36	29	39	38	49	39		49	3

^aData from United States Weather Bureau, Washington, D. C.

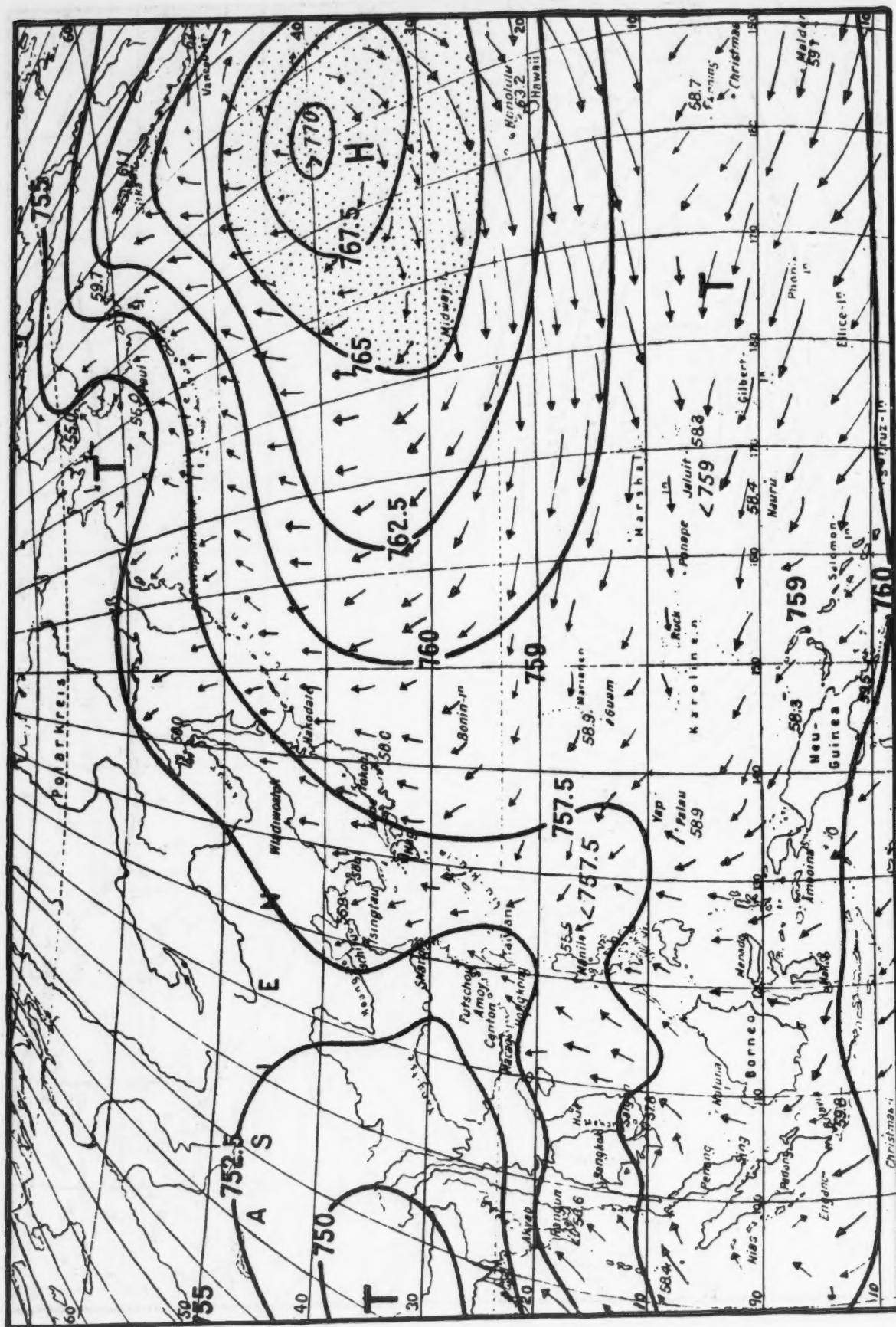


FIG. 12. August winds over the Marianas in relation to Pacific circulation. Numerals in large type indicate pressure in millibars, those in small type in millimeters. (After Schott)

The distribution of reporting stations in the Marianas fails to indicate the great variety of micro-climates occurring in these diminutive island areas. Due to exposure to prevailing winds, eastern coasts are more humid than western. The elevations, although slight, also receive a greater amount of precipitation. On Saipan, farmers pointed out the advantage of possessing land on Mount Tapotchau, where the somewhat heavier and more evenly distributed rainfall makes less agricultural adjustment to the dry season necessary. The high southern plateau on Rota has temperatures about 5° F. lower than those on the isthmus. This, combined with greater cloudiness and strong winds, has given rise to the native remark that 'winter' occurs on the Sabana. Along the eastern shores of the islands, the coasts are more constantly wind-swept. Here the Japanese planted windbreaks of fast growing Formosan Koa (*Acacia confusa*) and Ironwood (*Casuarina equisetifolia*) to protect the sugar cane fields.

Flora

The present distribution and nature of the flora represents a mirror of man's activity on the islands and is so artificial as to make it almost impossible to reconstruct the original climax pattern. The islands may originally have been covered with forest from shore to shore, although Anson described Tinian as an area of forest and meadow in 1742.¹ Grozet reported the same for Guam but suggested that the open areas were culturally induced, the Spanish having made clearings and brought in grasses for pasture.²

The native vegetation is tropical in character and shows a strong generic relationship with the plant life of Malaysia, Melanesia, and the Philippines. Since many of the plants now found in Micronesia have no particular adaptations for dissemination of their seeds, numerous geographic problems are involved in the migration and present distribution of occurring forms.

¹George Anson, *A Voyage Around the World in the Years MDCCXL, I, II, III, IV*, compiled from papers and other materials by Richard Walter ('Everyman's Library,' London: J.M. Dent and Sons, 1911), p. 281. Commodore George Anson circled the globe in 1740-44 under British naval orders to attack Spanish ports and shipping. After the voyage across the Pacific from South America, he anchored at Tinian with his sick and hungry crew. Later travelers explained Anson's over-enthusiastic description of the island as resulting from his having spent so many miserable days at sea.

²'Long ago the Spaniards cleared spaces of land for pastoral purposes. No other nation possessing colonies in the tropics appears to have laid themselves out like the Spaniards for the formation of savannas. The whole art of this rural operation consists in making small clearings, which are only separated from each other by bushes and clumps of trees,.... The Spaniards sow the clearings with varieties of grass seeds suitable for pasturage.' Grozet's *Voyage to Tasmania, New Zealand, the Ladrone Islands, and the Philippines in the Years 1771-1772*, trans. H. Ling Roth (London: Truslove and Shirley, 1891), p. 85.

Reflecting the isolation of the islands and the recency of their geological formation, the Marianas show a general paucity of species, a characteristic of the entire Micronesian area.¹ Being high islands, they support a richer flora than the low islands, due to a higher elevation, greater precipitation and more varied soils. The islands are not high enough to result in vegetation zoning and beach plants may be found on the highest points, depending upon such ecological factors as water availability, exposure, drainage, soil, substratum, and human activity. Because of this, most botanists classify the vegetation of these islands as strand type.

The present vegetation falls into several categories:

(1) *Mangrove*. - occurs to a microscopic and weak extent on Saipan in a single small coastal depression southward of Flores Point on the west shore. Filling and road-building have considerably reduced the former area of occurrence.

(2) *Strand*. - a community of vines, shrubs, and grasses, sometimes covering the beach until the strand is hidden and increasing in richness toward the beach ridge along which occur breadfruit (*Artocarpus communis*), Ironwood (*Casuarina equisetifolia*), Formosan Koa (*Acacia confusa*), and Kamachile (*Pithecolobium dulce*) (Appendix B).

(3) *Upper Strand*. - located on upper sea-side cliff levels within reach of salt spray; most highly developed on the exposed eastern windward coasts. Composed of vines, low shrubs, and coarse grasses on thin soils with frequent coral outcrops (Appendix B).

(4) *Modified Forest*. - this term, as used, applies to forests *in situ*, but so modified by cutting and removal of the larger trees that they bear little resemblance to the original cover. They occur only on cliffs, isolated terraces, and steep slopes. Areally limited, this type has its widest extent on Rota. Here it gives some evidence of its former character, a tangle of underbrush, ferns, vines, and trees. On Saipan remnants remain on Mt. Tapotchau and in narrow linear stretches adjacent to the upper strand on the eastern coast. Tinian, being more tabular, has been largely cleared for agriculture and shows the fewest examples of this type (Appendix B).

(5) *Planted Forest*. - tree areas planted by the Japanese. Consists of quick-growing Formosan Koa (*Acacia confusa*) and Ironwood (*Casuarina equisetifolia*), largely grown for firewood and minor timber uses.

¹In 'all the islands under Japanese mandate....less than 1,300 different species are known, of which 230 manifestly represent purposely or accidentally introduced ones. This relatively small flora includes representatives of approximately 620 genera in 192 families....these figures are based on the study of extensive modern collections.... Specific endemism is relatively high, for approximately 460 species are confined to the islands within the area under consideration. The generic endemism is very low; about seven endemic genera only are involved for the whole group.' Elmer D. Merrill, *Plant Life of the Pacific World* (New York: The Macmillan Co., 1946), p. 210.

(6) *Marsh*. - a plant society of minor extent, made up of grasses and sedges. Surrounds Lake Susupe on Saipan and occurs in two small areas along the eastern coast; found also on Tinian around Hagoi (lake) and near the head of Marpo Valley. The Japanese used some of these areas for rice but production has not been resumed by the natives (Appendix B).

(7) *Savanna*. - mostly sword grass (*Miscanthus floridulus*). Commonly associated with volcanic soils but has been extended onto other soils due to native practices of burning.

(8) *Former Cultivated Areas*. - mostly sugar cane. These have been invaded by weeds, vines, and *tangan-tangan* (*Leucaena glauca*) (Appendix B).

(9) *Cultivated Areas*.

Of these categories, only 'upper strand' can perhaps be said to be in equilibrium, since it occurs in soil areas of little value to man and has remained relatively undisturbed. To the above list might also be added a small group of plants quite different from the others in habitat, the genera which grow submerged in the shallow lagoon waters.

It should be noted that the accidental and deliberate introduction of plants by man has had a very definite bearing on the vegetation of the Marianas. The extent of this influence has been measured in Guam by Merrill, who estimated that 58 percent of the vegetation is introduced.¹ Most of the foreign types came in during the last three hundred years through the activities of Europeans or Orientals. Since this type of introduction carries plants over wide areas and occurs over long periods of time, it greatly decreases the certainty of tracing a particular species to its point of origin.

Soils

All the soils of the Marianas are lateritic in character, having evolved under high temperature and abundant rainfall. The weathered limestone on the terraces tends to form somewhat sandy soils, low in silicic acid and high in iron and aluminum. The andesitic rocks give rise to clay or clay-like soils, high in silicic acid and possessing a favorable silica-aluminum ratio. Nitrogen content is sometimes high, but depletes rapidly when the soil is brought under cultivation. In some of the valley areas, due to water action, materials from both types of rocks have become mixed producing a soil of good fertility. Considerable differentiation occurs in the soils from one island to another with wide variation in physical structure, profile, and chemical content (See Chapter IV, 'Soil and Associated Problems').

¹Elmer D. Merrill, 'An Enumeration of the Plants of Guam,' *The Philippine Journal of Science*, Vol. IX, Section C (1914) p. 20.

Fauna

The historical zoogeography of the Marianas presents problems similar to those of the flora. Because of isolation, fauna is limited. The only mammals are two species of bats. One of these, the *fanihi* or fruit bat (*Pteropus keraudreni*), is used by the natives for food; it is caught with long-handled swoop nets in the forest and along the cliffs at sunset. (Fig. 13 and 14). The *fanihi* nests in trees during the day, and at dusk flies over apparently well established routes to feeding areas of guava, soursop, sweet-sop, and screw pine. The second species is the small insectivorous, cave-dwelling *payesyes* (*Emballonura semi-caudata*). Unrestricted hunting, reduction of habitat by expansion of agriculture, and the attacks of the Taiwan Black-bird have almost eliminated the fruit bat on Saipan, Tinian, and Rota. The lack of guano deposits in the caves would indicate that *payesyes* are also few.

Rats and mice were inadvertently introduced from ships, and the small Marianas Deer (*Cervus mariannus*) was brought in from the Philippines by Governor Don Marino Tobias (1771-1774).¹ Rats of the common Norway variety (*Rattus norvegicus*) have long been a pest, but have become more so since the repatriation of the Japanese reduced human controls. Mice (*Mus musculus*) are less numerous. The Marianas Deer, under no biotic pressure, became so abundant as to be an economic pest.² Venison was long a favorite food staple of the natives, who hunted the animals with guns and dogs after burning stretches of sword grass to drive the deer into the open. Unlimited hunting and the reduction of natural habitat by the expansion of agriculture has now so reduced the number of deer that the killing of one is generally the occasion for a feast.³ Since the war, dogs and cats run wild in the abandoned areas and prey upon chickens on outlying farms.

Birds populate the islands in greater variety than animals. Over forty different species are reported for the Marianas; the islanders, however, were only able to name twenty-three, about one-third of which were mentioned as suitable for food. As with plants, the native names often apply to two or more closely related varieties. Many of the birds reported in check lists

¹William E. Safford, *The Useful Plants of the Island of Guam*, Vol. IX, *Contributions from the United States National Herbarium*, Smithsonian Institution (Washington: Government Printing Office, 1905), p. 76

²Safford writing in 1905 reports deer destroying whole fields of corn and young coconut plants. The animals made raids upon garden patches, often coming down into the Palace Gardens in Agana at night to feed upon melons and vegetables. Safford, *The Useful Plants of Guam*, pp. 76-77.

³During the period of a year's field work, only one deer was seen on Saipan and two on Rota. The animals are probably extinct on Tinian since almost the entire island was brought under cultivation by the Japanese.



FIG. 13. Fruit Bat (*Pteropus Keraudreni*)



FIG. 14. Net used by the natives in catching fruit bats. Ruin of former Japanese farm house in background. Note invasion of garden plot by weeds.

for the Marianas are undoubtedly now extinct or rare.¹ In general, the avifauna of the Marianas, as of all Micronesia, is related mainly to Melanesian forms, the tropical climate of the area favoring survival over that of birds reaching the islands from northern regions. The native birds are largely confined to natural habitats, and the rows of trees planted as windbreaks and around homes are little populated. There is some evidence, requiring further study, that the land birds are geographically distributed in relation to certain types of environment, but, in general, ecological controls on the islands seem to be less operative than in a continental area. Among the birds frequently seen are the fruit dove (*Phlegoenas xanthonura*), used for food and sometimes kept in confinement;² the blue and white *sihig* (*Halcyon chloris*), reported by the natives to eat young birds and to pick out the eyes of chickens; and on Rota, the Taiwan Blackbird,³ introduced by the Japanese to prey upon insects in the cane fields. Sea and shore birds, probably the first colonizers, are not so numerous as might be anticipated.

Reptiles are represented by the "iguana", a bird eating monitor lizard (*Varanus indicus*), which sometimes raids the farmsteads for eggs and young chickens.⁴ Iguana are more numerous on Rota than on either Saipan or Tinian. According to local reports, the Japanese used their skins for leather work. A blue-tailed skink (*Enroia cyanura*) inhabits the woods and fields, and geckos of several species frequent the houses, catching night-flying insects attracted by the light. Toads were introduced by the Japanese to prey upon insects. The only snake is the small *Typhlops braminus*, non-poisonous and very like an earthworm in appearance.

Insect life is abundant but not rich in species and shows some affinities to oriental forms. Many of the insects are introduced, especially those which are agricultural parasites. Flies and mosquitoes are troublesome but have been reduced on Saipan by frequent spraying and dusting of the settlement areas. The *Anopheles* type mosquito is not present. Other insects include termites, weevils, scorpions, spiders, centipedes, ticks, beetles, and wasps.

The shorewaters of the Marianas show a general scarcity of fish within the limited lagoon areas, probably due to dynamiting by the Japanese during the late years of the war, when fishing boats could not leave the harbor

¹Compilations of species for the Marianas often include birds reported by the early voyagers; no recent comprehensive check has been made of bird life.

²The natives sometimes hunt these birds with sling shots similar to those used by their ancestors before European discovery of the islands.

³Unidentified.

⁴Not a true iguana, although so called by the natives.

because of American submarines. In contrast to the inner waters, fish occur in greater abundance in the holes and crannies of the barrier reefs. Among the varieties commonly seen are parrot fish (*Callydentidae*), goat fish (*Mullidae*), mullet (*Mugilidae*), surgeon (*Hepatidae*), threadfish (*Polynemidae*), squirrel fish (*Helocentridae*), and carvelle (*Carangidae*). Schools of small silver-colored fish, known as *manahag*, appear in May and June off Rota and Guam, and are caught with throw nets and preserved by salting.¹ Anchovies (*Anchoviella purpureus* - Smith), used as live bait in bonito fishing, are found at the base of cliffs, especially around Tinian and at the northern end of Saipan. Sea cucumbers occur in shallow areas within the reef line, but are not used by the natives. Octopi are taken and spiny lobsters (*Panulirus marginatus*) are caught along the shore at night with the use of torches. In open water, flying fish (*Fistularidae*) are common and bonito and tuna are caught.

Prehistoric Occupance

To this island arc - tropic in climate, youthful in surface, and limited in vegetation and fauna - came man, late in the history of human migrations. Specifically when, by what route, and from what area the first inhabitants came is unknown. They were a part of the great wave of movement of southeastern Asiatic peoples into the Pacific - stone age Vikings who sailed the seas in out-rigger canoes and gained a foothold on the tiny bits of land scattered in a watery desert. When discovered by Europeans, the inhabitants made inter-island voyages along the Mariana arc, but the navigational skill which enabled their ancestors to reach the area appears to have declined, marooning the people in the Pacific area.

The aboriginal inhabitants, or Chamorros,² are of Mongoloid stock but of obscure origin.³ They were described by Pigafetta as having

blacke beardes and blacke heare on theyre heades which they weare longe downe to theyre wastes. They are of the same stature as we are, and well made, of couloure lyke unto an olyue. Theyre women are well fauored with blacke and thick heare on theyre heads reachyng to the grownde.^{1a}

¹Safford identifies these as probably the young of *Siganus marmorata* and *Siganus hexagonata*. Safford, *The Useful Plants and Guam*, pp. 87

²The word Chamorro is believed to be derived from the native term *Chamorri* denoting a noble of the highest rank. It was first applied to the inhabitants by the Spanish.

³R. W. Leigh, *Dental Morphology and Pathology of Prehistoric Guam*, Vol. XI, No. 3, *Memoirs of the Bernice P. Bishop Museum* (Honolulu: Bishop Museum, 1929), p. 6.

^{1a}See page 30, note 1.

In broad generalization, it appears that the Marianas were originally peopled by migrants from the Indonesian area, that the date of their movement may have been about 3000 B. C.,¹ and that they moved by way of the islands of western Micronesia and perhaps the Philippines. Some racial elements may also have been added by way of island routes from Japan. Acculturation and blood infusion have altered the original character of the Chamorro, increasing the problem of determining his point of origin and the probable date of settlement by noting broad patterns of physical and cultural relationships in southeastern Asia and the Pacific.

The prehistoric landscape was largely a wooded one broken here and there by villages and garden lands. Reflecting the importance of the sea as a source of food, settlement was mostly along the coast in villages of fifty to one hundred fifty huts; interior villages were smaller, seldom consisting of more than twenty buildings. Villages probably developed haphazardly into an irregular arrangement of dwellings along a main pathway.³ Well trodden trails gave access to the fields and the sea; beyond, the paths may have dwindled to single trails connecting with other settlements. The houses were constructed on stone and wooden piles, with plank or perhaps split bamboo floors and thatched walls and roofs. Conspicuous in each village was the canoe shed, or perhaps sheds, and the men's club house, which served as a masculine meeting place and the living quarters for the bachelors. Garden plantings surrounded the dwellings, and coconut palms flecked the settlement with shade.

The migrations probably brought the Chamorros to a more restricted environment than that of their original homeland. Yet, they were fortunate in occupying high rather than low islands of still less geographic variation.

¹Edward Arber (ed.), 'A Briefe Declaration of the Vyage or Navigation made abowte the Worldè,' *The First Three English Books on America*, (?1511)-1555, Being chiefly Translations, Compilations, etc., by Richard Eden (Westminster: Archibald Constable and Co., 1895), p. 254.

²Personal conversation with Dr. K. P. Emory of the Bernice P. Bishop Museum, Honolulu, Hawaii.

³The settlements, while called villages, were apparently not so in the true sense of the word. In 1682, Father Peter Coomans wrote from Rota in his annual letter on mission work that, after the burning of the church by 'unruly' elements, the governor 'arranged in regular rows, the houses which were scattered at random along the shore.' It would be interesting to know if each dwelling stood on the family farm land, as in the prehistoric Carolines, and if the so-called 'villages' were rural settlement clusters. Surprisingly, Father Coomans wrote that this was the first town in the Marianas, arousing curiosity as to the status of Agaña, the center of Spanish administration. Rev. W. C. Repetti, 'A Seventeenth Century Letter from the Island of Rota,' *Guam Recorder*, Vol. XVII, (November, 1940), p. 320.

Within the bounds of their neolithic culture, they pressed every possible item of their habitat into use. The soil and the sea formed the base of their economy; they were a gardening, hunting, fishing, and collecting people. Tillage was accomplished with digging sticks and a stone-bladed hoe. Their farm plots, garden-like, interplanted, and storied, were shifted when the soil became exhausted. Rice was grown in stream areas and marshes and bread-fruit, coconuts, yams, taro, sugar cane, and bananas occupied the higher land. Edible fruits and roots were collected from the jungle; birds and bats were captured for food; fish, crab, and turtles formed part of their diet. They did not know the bow and arrow but used sling stones in hunting and warfare. By barter and the use of shell money, a limited trade was carried on between the islands and with the western Carolines.¹ Over the centuries, Chamorro patterns of occupance made little change in the primeval landscape; a few rice paddies and perhaps some of the field areas were permanent, but the forest remained dominant.

Attesting to the density of the early population are numerous artifacts, still to be found on the surface--sling stones, stone pestles and mortars, occasional bone implements, and scattered potsherds. Conspicuous reminders of the former age are the *latte*, double rows of stone pillars which served as supports for houses and canoe sheds (Figs. 15 and 16).² Most outstanding of these ruins is the 'House of Taga' on Tinian, formerly the largest and central-most structure in a group of seventeen others destroyed by the Japanese with the expansion of Tinian Town.

Discovery

The Marianas were first made known to the Western world by Magellan, who discovered the islands, March 6, 1521, after a hazardous voyage across the Pacific, so far northward that the central Micronesian Islands were bypassed. According to accepted tradition, the thirsty starving crew anchored at Guam, offshore from Umatac. The chronicles left to us are most indefinite as to Magellan's route through the Marianas (Fig. 17). Such navigational information as was recorded by Pigafetta does not clearly indicate that Guam

¹This trade was probably initiated by the Carolinians rather than by the Chamorros. Laura Thompson, *Guam and Its People* (Princeton: Princeton University Press, 1947), p. 36.

²Laura Thompson, *The Native Culture of the Mariana Islands*, Bulletin 185, Bernice P. Bishop Museum (Honolulu: 1945), p. 12.



FIG. 15. Ancient Chamorro Village



FIG. 16. Saipan: Garapan after American capture. After air and sea bombardment, the town was taken by the Americans in house-to-house fighting.

was the first island upon which a landing was made, nor what other islands may have been sighted.¹ While Magellan is credited with the discovery of Guam and Rota and perhaps the sighting of Tinian, Aguijan, and Saipan, it appears that the basis for this belief may rest on stories told by the natives when the Spanish later occupied the Mariana Islands rather than upon primary historical sources. The discovery of the islands in the Mariana chain north of Saipan is sometimes attributed to the Jesuit missionaries, Fathers Morales and Sanvitores, who voyaged northward in the years 1668 and 1669 in their work of carrying Christianity to the natives. It is probable that these missionaries made the first landings on the northernmost islands, but they had been sighted and recorded on maps appearing as early as 1544 (Fig. 18).

Upon discovery of the islands, Magellan christened the archipelago, 'Las Isles de las Velas Latinas' (The Islands of the Latine Sails) because of the triangular shape of the sails used on the native canoes. His experiences with the natives, however, led him to change the name to 'Las Isles de las Ladrones' (The Islands of the Thieves), and the islands became known as the 'Ladrones.' When Magellan's ships first anchored, the natives came crowding aboard, taking everything that could be carried away. This led to bloodshed, beginning the

¹Magellan's personal records have been lost. The most complete account of the voyage is that of Antonio Pigafetta, who accompanied Magellan. Of Pigafetta's account, four manuscripts are known, three in French and one in Italian. These list incorrect coordinates for the Marianas and describe the islands so briefly that island identification is difficult. In a translation of the Italian manuscript, James Robertson gives Pigafetta's description of the discovery '....lying in twelve degrees latitude and 146 in longitude, we discovered Wednesday, March 6, a small island on the north-west, and two others to the southwest, one of which was higher and larger than the other two' (James A. Robertson, *Magellan's Voyage Around the World by Antonio Pigafetta* [Cleveland: Arthur H. Clark, 1906], Vol. I, p. 91). The Stanley translation, made from one of the French manuscripts, agrees with that from the Italian (Pigafetta and other contemporary writers, *The First Voyage Around the World by Magellan*, trans. Lord Stanley of Alderley, Vol. LII, works issued by the Hakluyt Society [London: The Hakluyt Society, 1874], p. 68). Burney believes the islands discovered to have been Saipan, Tinian, and Aguijan, (James Burney, *Chronological History of the Discoveries in the South Sea or Pacific Ocean* [London: L. Hansard, 1803], Part I, p. 57). Maximilianus Transylvanus, Secretary to Charles V of Spain, in writing to the Cardinal of Salzburg in 1522, describes the discovery of the Marianas as follows: 'and when for three months and twenty days, they had been sailing....at last they saw an island, called as they learned afterwards, Inuagana....they discovered the altitude of the Arctic pole to be 11 deg. The longitude they thought to be 158 deg. west of Gades (Cadiz, Spain). Then they saw other and still more islands, so that they knew they had arrived at some vast archipelago. When they reached Inuagana, the island was discovered to be uninhabited. They then approached a rather small island, where they saw two Indian canoes.... They asked the Indians the names of the islands.... They understood that the name of the island in which they had been was called Inuagana, but that the one where they now were was Acaca' (Maximilianus Transylvanus, 'A Letter to the Most Reverend Cardinal of Salzburg,' October 23, 1522, in Pigafetta and other contemporary writers, *The First Voyage Around the World by Magellan*, pp. 197-198). Blair and Robertson, in translating from The Transylvanus letter, spells Acaca as Acancan, and concludes with the deduction that Inuagana applies to Agana, now a local place name on Guam, and Acancan to Sosan (perhaps Songsong) on Rota (Emma Helen Blair and James A. Robertson, *The Philippine Islands, 1493-1898* [Cleveland: Arthur H. Clark, 1903], Vol. I, p. 321).

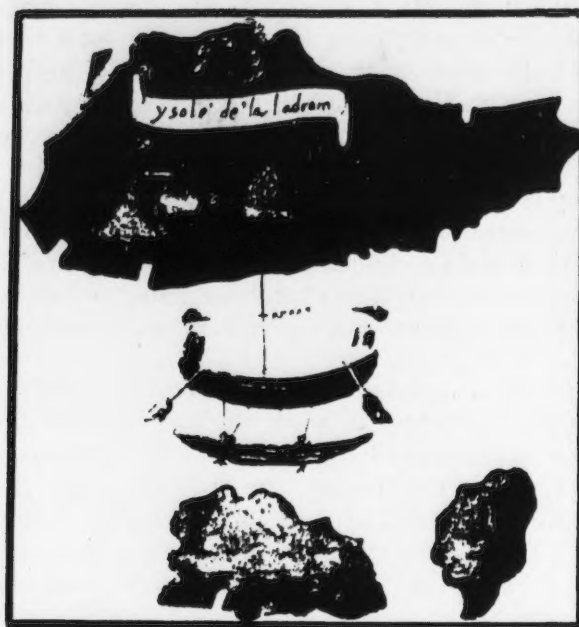


FIG. 17 Pigafetta's map of the Ladrone or Marianas.

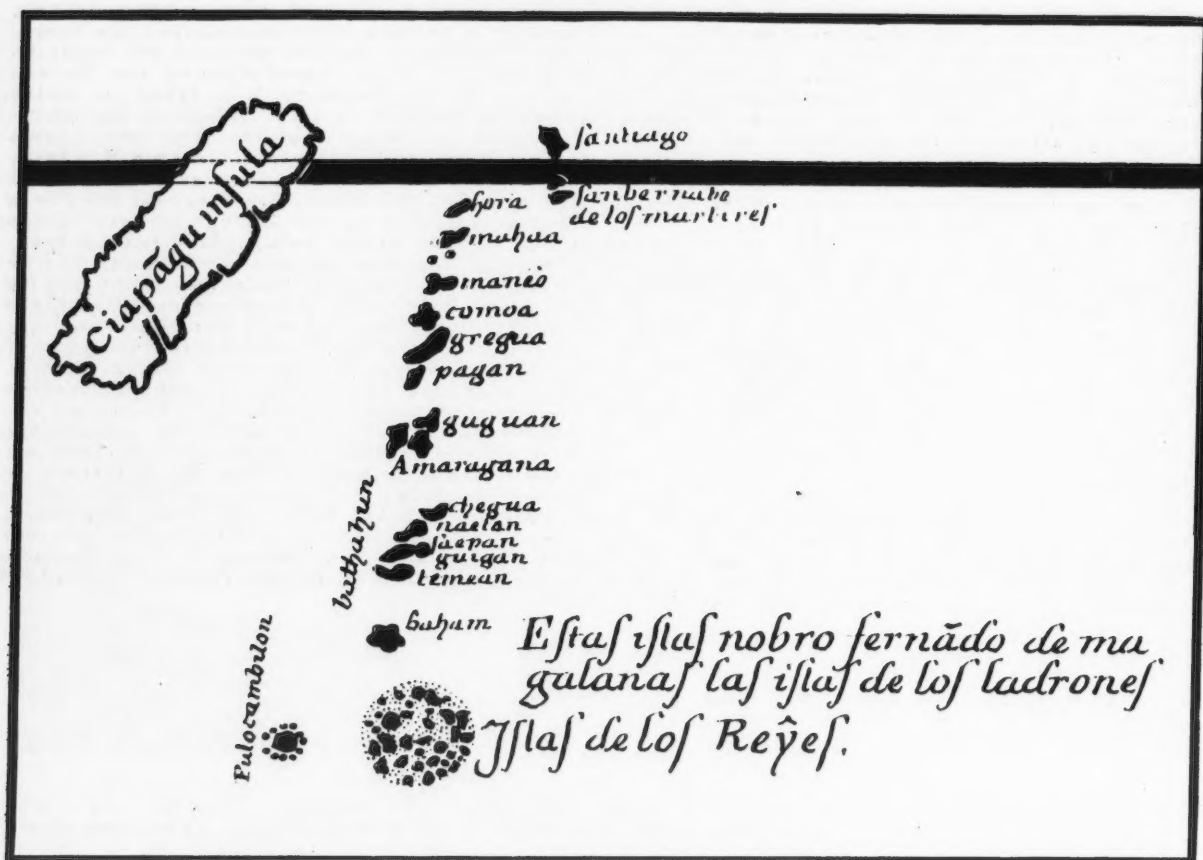


FIG. 18. Map of the Ladrone (Marianas) from Sebastian Cabot's Map of the World, 1544.

modern history of the islands with a violence that was to eventually almost exterminate the natives. After the arrival of the Jesuits in 1668, the archipelago was rechristened the 'Marianas' in honor of Queen Maria Anna, widow of Philip of Spain and patroness of the first missionaries. 'Marianas' is now the accepted form, but the term 'Ladrones' is still sometimes used, particularly in hydrographic literature and sailing directions.

Spanish Period

Lacking gold or other quick material wealth, the Marianas held no particular attraction for the Spanish, and the islands remained virtually independent for nearly a century and a half following Magellan's discovery. In 1668, missionary activity was initiated¹ and, after first meeting with every success, aroused an opposition which led to open revolt against the priests and Spanish troops. Sporadic conflict continued until 1694, when, as a last measure, the inhabitants of all the islands were transported to either Saipan or Guam. Those on Saipan were later removed to Guam in 1698. War, famine, and disease so reduced the Chamorros during the first two centuries of Spanish rule that, of the original population, estimated at between 40,000² and 73,000,³ only 3,169 remained in 1784.⁴ In 1790, the number was 1,639 and in 1825 was reported as 600.⁵ Today no pure-blooded native remains (Figs. 19 and 20). Mating with the Spanish and Filipinos produced a hybrid group which forms the basic mixture of the present stock.⁶ To this has been added German,

¹The first mission to the Marianas was under the direction of Padre Diego Luis Sanvitores, who first stopped at Guam in 1662 while enroute from Mexico to the Philippines. Determined to carry the gospel to the islands, he spent the next six years moving the officials of the Philippines and Mexico to action and did not return to Guam until 1668. His work, which earned him the title 'The Apostle of the Marianas,' eventually led to his martyrdom on Guam in 1672.

²Otto von Kotzebue, *A Voyage of Discovery into the South Sea and Beering's Strait* (London: Longman, Hurst, Rees, Orme, and Brown, 1821), Vol. I, p. 79.

³Louis de Fresycinet, *Voyage autour du monde* (Paris: Chez Pillet Aine, Imprimeur-Libraire, 1829), Vol. II, p. 328.

⁴Louis de Fresycinet, *Voyage autour du monde* (Paris: Chez Pillet Aine, Imprimeur-Libraire, 1829), Vol. II, p. 337.

⁵Paul J. and Ruth Searles, *School History of Guam* (Agana: Naval Government Print Shop, 1937), p. 31.

⁶The government of the Philippines began the practice of deporting Filipino convicts and political prisoners to Guam in 1680.



FIG. 19. Aged Chamorro woman and child.



FIG. 20. Native Types. Second man from right is of mixed Chamorro and Carolinian descent, the others are Chamorros.

Japanese and American blood, with traces of other nationalities from the period of the whaling days. While the Chamorros decreased, the hybrid group, especially the Filipino-Chamorros, increased. In 1783, the total population numbered 3,231 and in 1816, 5,389.¹ While admixture is to be noted in the present population, the various strains have thoroughly amalgamated, producing a distinctive racial type. In the long period of Spanish rule, acculturation also brought many changes in the native manner of living, until the Chamorros are now one of the most modified groups in the Pacific. However, some cultural traits, such as language, and certain personality characteristics have persisted. In Guam, American influence has left its imprint. In the northern Marianas, German rule was too brief to make much change in the patterns already established. The Japanese sought to reshape native attitudes and habits to fit into the socio-economic structure established on the islands with colonization and commercial development, but the total amount of influence was small. Throughout the Marianas, the pattern of life is still basically a combination of Spanish and native elements.

The Carolinians form a second component of the present population. A small group of these people rediscovered Guam in 1788, and, eager for iron and other trade goods, continued to make annual trips until 1873.² Eventually, a few remained to settle, and a small colony was established at Timoning on the northwest coast of Guam. Encouraged by the Spanish officials, who needed laborers for the copra industry, other Carolinians settled in the northern islands. This movement began in 1815, when a group of about two hundred from the Truk region received permission to settle on Saipan after their home island had been devastated by a typhoon. In 1865, about one thousand more entered the region, settling on Guam, Saipan, and Pagan; others migrated to Tinian in 1869. By the end of the Spanish period, their numbers in the islands north of Guam totaled about 852.³ For a time, the Carolinians were the dominant racial group on the islands northward of Rota, becoming outnumbered only in the late Spanish regime as the Chamorros were attracted from Guam by the possibilities of copra production.

¹Figures are from von Kotzebue, *A Voyage of Discovery*, Vol. III, p. 90. Beginning in 1783, no distinction was made in the census between Chamorros and persons of mixed parentage.

²Each year, twenty or more canoes from Faraulep, Lamotrek, and Woleai in the Western Carolines and Puluwat in the Eastern Carolines assembled at West Fayu for a cooperative voyage to Guam. Leaving West Fayu in April, at the end of the northeast trades, they made the three-hundred mile trip to Guam in eight days, and returned in May or June with the beginning of southwest winds. Shells, mats, cordage, and canoes were bartered for hatchets, machetes, beads, cloth, and cooking utensils.

³Based on figures from the first complete German census. U. S. Navy Department, Office of the Chief of Naval Operations, *Mandated Marianas Islands*, OPNAV-P22-8, *Civil Affairs Handbooks* (Washington: 1944), p. 34.

Long before the beginning of missionary activity in the Marianas, Guam became a supply station for Spanish galleons plying between Acapulco, Mexico and Manila in the Philippines. The ships, only one a year during the early colonial period, were dispatched from New Spain in February and, taking advantage of the trades, made the reckoned seventy-day journey to Guam without altering their sails, arriving in the Philippines before the beginning of the westerly monsoons. Guam, the only stop along the route, afforded a supply of fresh water and, equally important in those days of scurvy-plagued ocean travel, fresh vegetables and fruits, which were obtained by barter with the natives. On return voyages, the galleons plied farther north, taking advantage of westerly ~~the~~ winds on their return route to Mexico. The early importance of Guam as a way-station increased as American trade expanded in the Pacific and reached an apex during the whaling period, between 1820 and 1870.

During the Spanish period, the history and the economy of the Marianas were centered in Guam. The small Spanish population consisted largely of administrators, churchmen, and soldiers. Native farms supplied food, the sea, a subsistence catch. In years of drought or typhoon destruction, supplies were imported from the Philippines. The government was supported by subsidies, first from Mexico and then from the Philippines, in response to a shifting of Spanish colonial administration in 1815, following the revolt of the colonies in the Americas. The subsidies were discontinued in 1855. Trade was a monopoly of the appointed governor until 1828 and did not function to raise the economic level of the islanders. Use of the island of Guam as a station for supplies and repairs was mostly to the advantage of the Spanish and a few closely linked Charmorro families. Copra, some coffee, and cacao were exported after 1860, but production was small in relation to potentialities. Probably the major economic advantage from Spanish rule was the introduction of domesticated animals and new fruits and vegetables. It appears that the Chamorros may have had domesticated fowl, but pigs, cattle, water buffalo, goats, horses, sheep, cats, and dogs were unknown to the islanders.¹ Each family formed an economic unit, all the members working to provide essential needs. In Guam, a small landed class developed, consisting largely of Spanish-Chamorro descendants. The greater part of the land, however, was owned by the peasants, many of whom had fallen into a system of peonage by becoming involved in debt.

The islands northward of Guam received little attention during the Spanish period; but since they lay across the trans-Pacific route to the Philippines, their possession was jealously guarded. Although little control was maintained over the natives who resettled the area, squatter colonization by aliens was not permitted. Such attempts as were made were soon broken up

¹The sheep brought in did not thrive; there are now none on the islands.

for fear of future dispute over sovereignty.¹ These settlements, similar to others made in the Pacific during the same period, were based on trade with whaling vessels and the development of copra production. The Spanish were not opposed to settlement; in fact, the governor-general of the Philippines had issued an order that no obstacle should be placed in the way of colonization; but unauthorized occupation was not permitted, and the colonists were expected to acknowledge the supremacy of Spain.

Rota is unique among the northern Marianas in that it, like Guam, has had a history of continuous Chamorro settlement.² A few of the early inhabitants escaped removal by hiding in caves, and their numbers were increased by the emigration of dissatisfied and unruly elements from Guam. Eventually, Spanish administration was established and trade resumed between the two islands. In 1866, the island supported 103 households, or a total of 442 persons;³ at the end of the Spanish period, the number was about 490.⁴

Tinian, once depopulated, never again became important in the Chamorro sphere. The Spanish used the island for a game preserve, sending regular expeditions to hunt the pigs and cattle which ran wild after the removal of the population. Pork, preserved by salting, and jerked beef, were transported to Guam, some of the beef being sent on to the Philippines. In 1865, an Irishman named Johnson and his sister leased the island and brought in two hundred and fifty Carolinians to hunt cattle and pigs, collect trepang, and

¹Kotzebue, in writing on alien settlement in the Marianas after his visit to Guam in 1817, tells the story of an American citizen, Captain Brown, who, with his crew and a Mr. Johnson, carried off seven men and fifteen women from the Hawaiian Islands, with the intention of settling on Agrigan. They landed, however, on Saipan and Tinian. 'It was made known in Guahon (Guam) that there were strangers on Saypon (Saipan) and Tinian, and the governor....sent thither, and it was in the course of....bloody combats, that in June 1810 Johnson, with four whites, two Negroes, and seven Sandwich Islanders, and the fifteen women were brought to Guahon, where he, himself, remains.' Two other settlements are mentioned by the same author. 'In May, 1815, by command of the Captain-general of the Philippines....a settlement on Agrigan was broken up, and nearly forty men, of whom one was an American. Perhaps Captain Brown who escaped capture on Saipan and Tinian, three Englishmen, and the rest Sandwich Islanders were brought to Guahon..... It is well known from authentic information, that there is already a new settlement on Agrigan (1817)' (von Kotzebue, *A Voyage of Discovery*, Vol. III, p. 87).

²Many ancient customs were preserved on Rota long after they disappeared among the other Chamorros. Less influenced by the Spanish, the inhabitants have maintained their language in a somewhat purer form than on the other islands; Rotanese Chamorro contains words not used elsewhere in the Marianas and is spoken with a higher pitch.

³von Kotzebue, *A Voyage of Discovery*, Vol. III, p. 91.

⁴The figure is taken from the first complete German census (1902) as given by Rudolph Fitzner, 'Die Bevölkerung der deutschen Südseekolonien,' *Globus*, LXXXIV (July, 1903), p. 24.

raise fruits and vegetables for trade with Guam and the provisioning of trading vessels. The project proved successful but was abandoned about 1878, after Johnson, according to a native informant, was lost at sea on a trading expedition to China.¹ Johnson's activities on Tinian had so depleted the wild livestock that hunting was prohibited for seven years, after which a group of twenty Chamorros were settled on the island to hunt the animals and to prepare the meat for shipment. Other Chamorros joined the group, and a small village, known as Taga, developed near the harbor area on the site later occupied by Tinian Town under the Japanese. The population at the end of the Spanish period numbered at 95, of which 59 were Carolinians.²

Saipan, the first of the northern islands to be reoccupied, had become the second most populous island in the Mariana group by the end of the Spanish period. Population totaled about 1,631,³ of which 621 were Carolinians.⁴ Garapan, the largest settlement, had been established by the Carolinian group which settled on the island in 1815. The only other settlement was the small village of Tanapag, located on the coast northward from Garapan. The population here was entirely Carolinian; in Garapan, however, Chamorros, attracted to Saipan by possibilities of copra production and greater freedom from Spanish control, outnumbered the Carolinians.

Following the Spanish American War, Guam was acquired by the United States under the terms of the Treaty of Paris, December 19, 1898. The island was already in our possession, having been captured in the previous summer. Hard pressed financially, Spain sold the remaining Marianas to Germany for \$4,500,000 in 1899. From this point onward, the political administration of the northern Marianas diverged from that of Guam with consequent differences in land utilization and economic development.

German Period

The Marianas proved an economic liability to the Germans, costing far more in government expenditure than in value returned. Ambitious plans were made for the commercial development of the islands, based largely upon native labor. The area was too distant and too limited in resources to arouse

¹No documentation was discovered in support of this statement.

²The figure is taken from the first complete German census (1902) as given by Fitzner, 'Die Bevölkerung der deutschen Sudseekolonien,' *Globus*, LXXXIV (July, 1903), p. 24.

³The figure is taken from the first complete German census (1902) as given by Fitzner, 'Die Bevölkerung der deutschen Sudseekolonien,' *Globus*, LXXXIV (July, 1903), p. 24.

⁴U. S. Navy Department, *Mandated Marianas Islands*, p. 34.

interest in Germany, although special inducements were offered to colonists. German population, mostly administrators and priests, at no time numbered more than twelve or fifteen. The islands were never considered of value strategically, and at the beginning of World War I they were taken by the Japanese without a struggle.

The German agricultural program, based chiefly on copra, fell far short of planned objectives. Government land on Saipan and Rota was leased to planters, while the native communities were held responsible for planting and harvesting unleased land. Copra output, however, declined drastically from the estimated potential. Due to inclement weather, typhoons, insects, and, as the Germans reported, 'indifference of the natives,' exports which had amounted to M. 230,576 in 1903 fell to M. 9,700 in 1905. Recovery was slow and never again reached the 1903 figure during German occupation. The islanders were encouraged to diversify their crops and required by law to farm at least a quarter-hectare plot. Failing this, they were obliged to contribute an equal amount of labor to a community garden.¹ Stock raising was encouraged on Saipan and Rota, and new stock was imported to improve the local breeds. As under the Spanish, the Germans continued to use Tinian as a grazing area, organizing the Tinian-Gesellschaft for the production of meat, hides, and bones. Some of the production was for interisland trade, but the hides and bones were sold to the Japanese, and some of the meat was sold to Guam. Another company, the Pagan-Gesellschaft, was organized to develop the copra industry in the northern islands and to exploit the guano deposits.

Foreshadowing the future, the Japanese dominated the trade of the area, following their commercial entry about 1890. By the end of the German period, the Japanese formed the largest foreign population component in the islands. Their control was so complete that the Germans had little choice but to import and export their goods through Yokohama.² When copra production declined, the Japanese sought to increase their trade through development of fisheries, but these did not prosper until the islands came under Japanese rule. Although the Germans occupied the area in 1899, the Japanese mined guano on the three northernmost islands until 1907 and, after the Pagan-Gesellschaft was organized, Japanese workers were employed by the Germans to mine and ship the guano.

During German administration, health measures were imposed, public schools established, roads extended, and coconut plantings greatly increased. The older Chamorros, who remember the German period, look back upon it with nostalgia--a 'happy time' when life was not 'too hard.' Many of these memories have been colored by time; nevertheless, the Germans provided a good administration and protected native interests. Their period of occupancy, however, was too short to leave much imprint upon either the people or the landscape.

¹U. S. Navy Department, *Mandated Marianas Islands*, p. 28.

²In 1902-1903, the total exports consisted of M. 173,000 of copra and M. 122 of miscellaneous articles, which went to Japan, and M. 1,945 of tobacco, which was sold to Guam. Of the imports for the same period, consisting of foodstuffs, textiles, and cheap manufactures, and valued at M. 57,784, M. 54,502 came from Japan.

Japanese Period

With the shift to Japanese administration, the relative importance of the islands acquired new significance. For the first time since foreign domination, the northern Marianas were easily accessible to the ruling power. Unlike Spain and Germany, Japan had need for the area. Confronted by problems of overpopulation and food shortages, every bit of land, no matter how small, had value if suitable for settlement or food production. The islands lay along routes of Japanese economic expansion and in a climate to which the Japanese are culturally well adapted for colonization. Along with the other islands of Micronesia, the Marianas also had strategic value to Japan and were desired as a protective screen. Since the islands were also of strategic importance to the United States and Australia, both countries protested their assignment to the Japanese by the League of Nations.¹ Inasmuch as the islands had been occupied near the beginning of the war, Japanese control was a *fait accompli*, and the exploratory utilization which was to bring the Northern Marianas to their fullest commercial development had been initiated.

Immediately following occupation of the islands, the Japanese leased lands not in conflict with military and administrative needs. At the time, southward expansion was the subject of much thought in Japan, and the persons first attracted were business speculators generally inexperienced in tropical agriculture. Numerous failures followed; and it was not until the granting of the Mandate, the establishment of the South Seas Government Bureau, and the organization of the Northern Marianas as the Saipan Administrative District that more conservative capital ventured into the area and laid the foundations for a successful economic structure. All resources were surveyed, and those of commercial value were brought into production under private or government auspices. Twelve companies were organized to operate throughout the Micronesian area. Of these, the South Seas Development Company (Nanyo Kohatsu Kaisha) and the South Seas Trading Company (Nanyo Boeki Kaisha) were the most influential, having the heaviest capitalization and the greatest number of branches. Both were active in the Saipan District.

Japanese commercial enterprise and colonization brought a complete change of landscape. All arable land was cleared and platted to fields. Saipan, then Tinian, and finally Rota became sugar plantations. Japanese nationals, a large part of them Okinawans, dotted the countryside with farmsteads. The road system, started by the Germans, was extended to cover all the island areas, and narrow gauge railways were constructed to transport the cane (Fig. 21). Sugar refineries were built at Garapan, Tinian Town, and Songsong; port facilities were improved; and regular shipping services maintained with Japan, the Carolines, and the Marshalls. Garapan, the administrative and commercial center for the Northern Marianas, grew from a village to a

¹ Japanese administration of the islands was not accepted by any of the allied powers until March, 1917. Great Britain then agreed to support Japanese possession of the former German Micronesian holdings in return for aid in protecting allied shipping in the Pacific and the Mediterranean. The terms of this agreement, contained in the Secret Treaty of London, were approved by France and Russia before the peace conference in Paris in 1919.

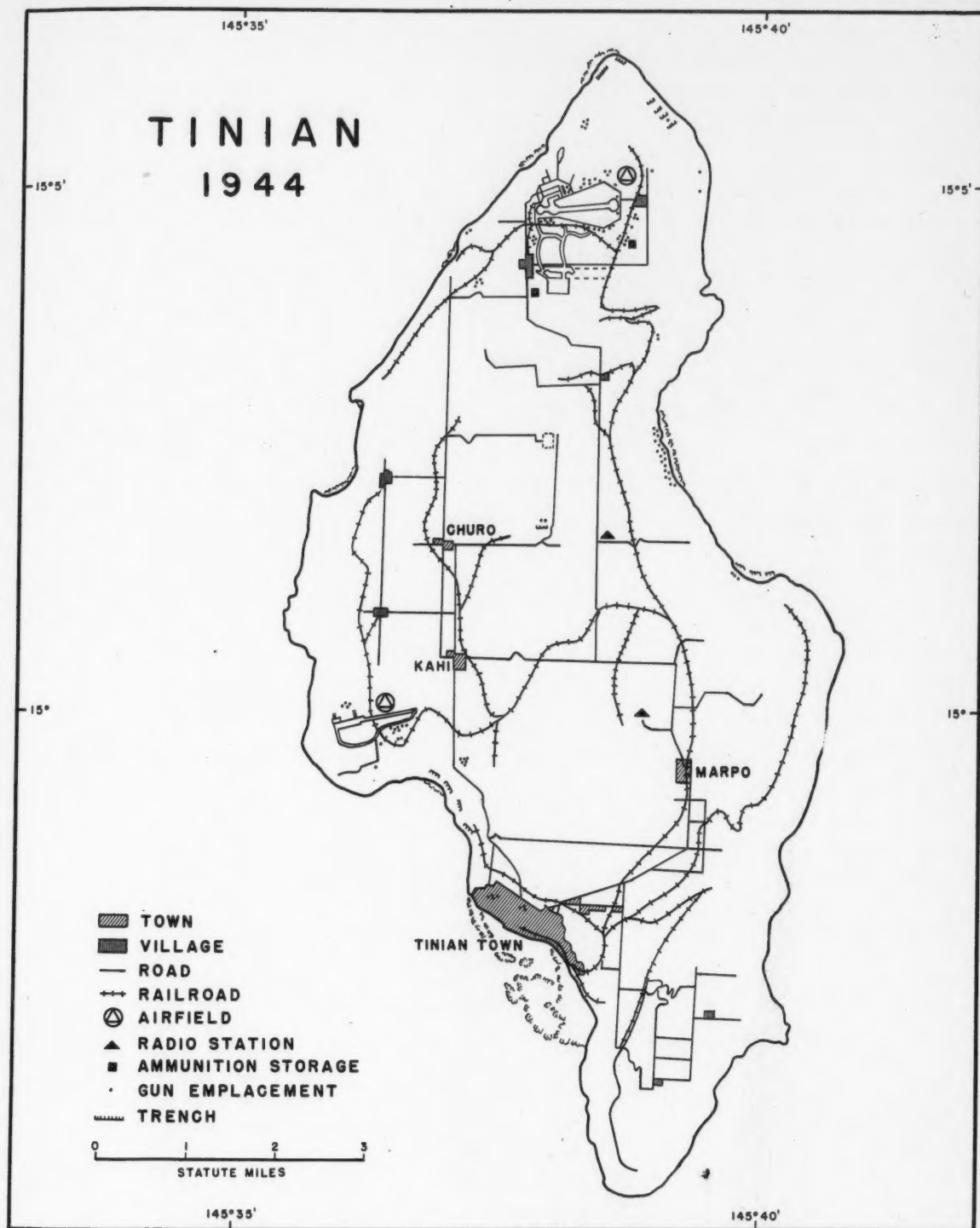


FIG. 21

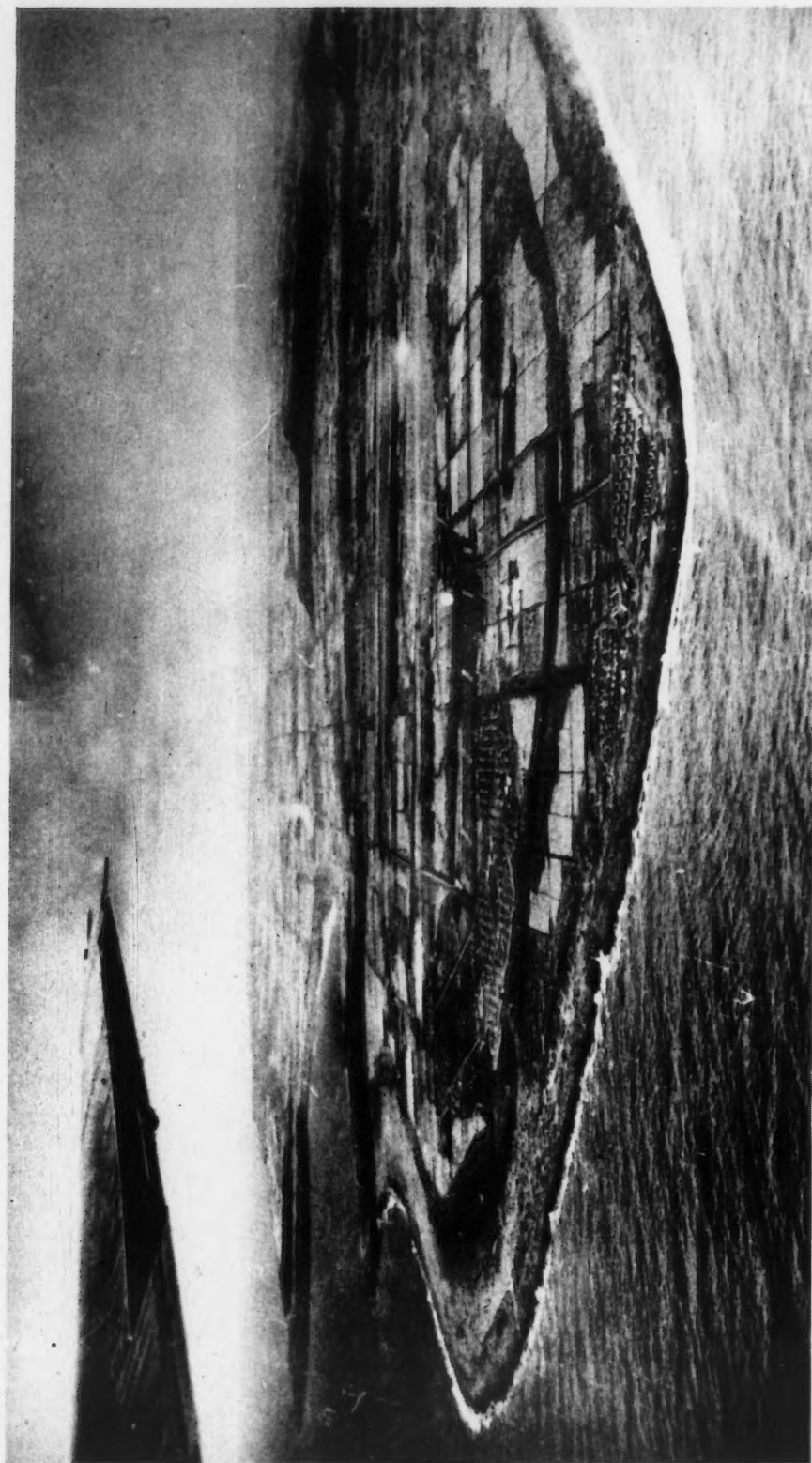


FIG. 22. Tinian: Air view southward over island. Picture prior to American invasion. Note regular field pattern, use of trees for windbreaks, and tabular character of the surface. Japanese military camps in foreground.

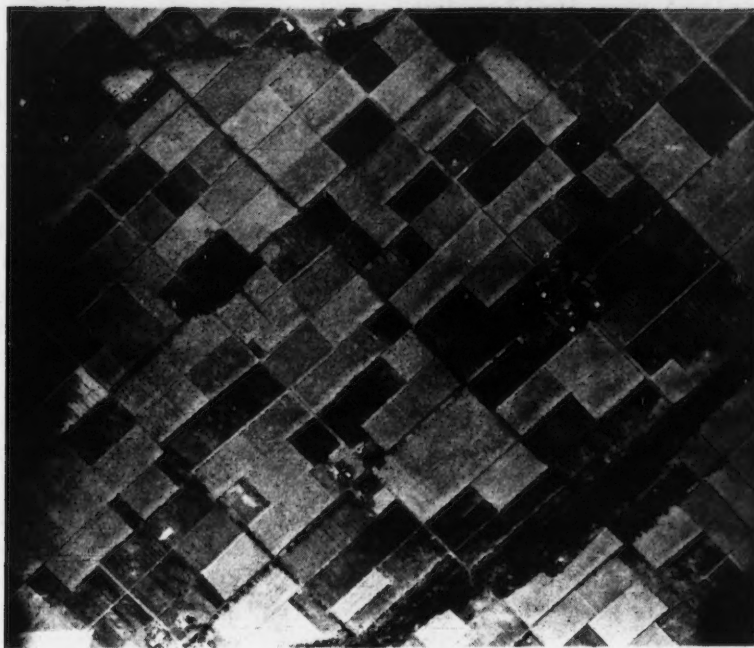


FIG. 23. Tinian: Japanese rural settlement pattern. Note grouping of houses at road corners, and rectangular field arrangement.

town of 12,827.¹ With the inflow of settlers, the natives became a minority group, numbering 4,145 in the total population of 46,708 in 1937. Their future was indicated by a slow trend toward intermarriage with the Japanese.

Sugar production dominated the geographic scene, setting the tempo of island life with its seasons of planting, harvest, and manufacture. The industry was controlled by the South Seas Development Company, which leased government land and rented it in turn to tenant farmers, who produced cane under contract. Heavy subsidization was provided by the Imperial Government as a part of the policy of colonial expansion. No business or income taxes were required, grants were given for the clearing of land, initially no rental was paid for the use of government land, and until 1936 shipping subsidies were granted. The annual sugar tonnage supplied from 4 to 6 per cent of the sugar supply of the empire. Production in 1937, the last year for which statistics are available, was 53,146 tons and constituted 82 per cent of the total value of exports from the Saipan District for that year.

The sea as well as the soil was made to yield a harvest. Fishing, like sugar production, was heavily subsidized. Bonito and tuna were the main commercial fish. Production of marine products in 1937 was 4,365 tons. Although this represented less than one-half of one per cent of the total catch made within the empire, fishing was the second most important industry in the Northern Marianas, supplying 5 per cent of the exports from the area.

¹1935.

The pattern of Japanese occupance was best developed on Tinian (Figs. 22 and 23). The island was divided into rectangular plots of 6 *cho* (14.7 acres) each, which were leased by tenant farmers. Rural settlement was dispersed, with a tendency towards the grouping of houses at road crossings. The farm homes, constructed of wood and thatch or sheet metal, were destroyed by the war, but the ruins of cement cisterns and barns remain to mark the farm sites. Each barn and its associated pig pen was constructed to form a fertilizer unit, all waste draining into a compost pit to which were added night soil, grass, and *bagasse* from the sugar mill. The main road pattern was irregular, following the contours from one terrace level to another, but the secondary system formed a regular network conditioned by the field arrangement. Wind-breaks bordered the roads and separated some of the fields of cane. Small villages served the needs of the various parts of the island, while Tinian Town developed as the main milling center and port (Fig. 21). Because of the presence of natives on Saipan and Rota, the Japanese pattern, while predominant, was broken by the irregular farm lands of the islanders. The fields of cane, occupying 68 per cent of the arable land of Saipan, 80 per cent of Tinian, and 33 per cent of Rota, indicated the major application of human energies in the region. Each island was primarily a sugar plantation, vertically integrated in the production of sugar, from planting to final product, engaging the major part of the inhabitants either in direct production or in supplying the needs of the sugar workers. It was this landscape, the result of thirty years' labor on the part of the Japanese, that was first disrupted and then destroyed by the war.

CHAPTER III

War and Landscape Change-

The Origin of the Problem

Landscape is never constant. The change may be slow almost imperceptible as a region reaches its climax, often little more than the annual cycle of change in vegetation and human activity induced by the seasons. Again, the change may be rapid and catastrophic, resulting from either natural or man-made forces. In the Marianas, history engendered elsewhere swept the islands and made them headline news. War transformed Saipan, Tinian and Rota from productive communities to devastated areas of dislocated population and broken economy requiring immediate and long range rehabilitation.

Japanese War Preparations

The transformation which eventually ended with a complete revolution in the cultural environment and modification of the natural surroundings, had its beginnings under the Japanese. Landscape change began as Japan moved toward war and intensified as the enemy came nearer. A pattern of major and minor airfields was laid down for bomber and fighter planes. On Saipan, the sugar-cane fields near Asurito were developed into an airfield, and two other strips were hurriedly undertaken, one on the level terrace at Marpi Point, the other on the coastal lowland between Chalan Kanoa and Garapan. Two fields were built on Tinian and a third one started (Fig. 21), while on Rota, a field was laid down on the northern plateau just north of Shinaparu village. (Fig. 24) Around these fields, barracks and administrative buildings were erected. Pressure for defenses increased as the relative position of the islands changed with the American capture of the outermost Japanese holdings in Micronesia, and the Marianas came to lie along the first rather than the second line of defense.

As military construction became more imperative, the natives were pressed into labor, each household being required to provide one person per day. This work fell to the men and resulted in neglect of farm lands or the work of women in the fields. Inflow of troops brought housing pressure. Construction could not keep pace with the need for shelter, and on Saipan the native residents of Garapan were compelled to move to their farmsteads so their homes might be used as billets. Countless problems arose in the daily transportation of native labor to and from work. The native schools were closed and the buildings used to house soldiers. Strain on resources became severe as United States submarines shut off the shipping lanes. Food shortages developed, and it was necessary to divert some of the fields from their customary use for export products to the growing of truck crops. Twenty-nine thousand troops were stationed on Saipan, ten thousand on Tinian and a smaller number on Rota. Just before the American attack, the islands were armed camps, points of defense coordinated with Japan and the other islands in the Marianas chain.

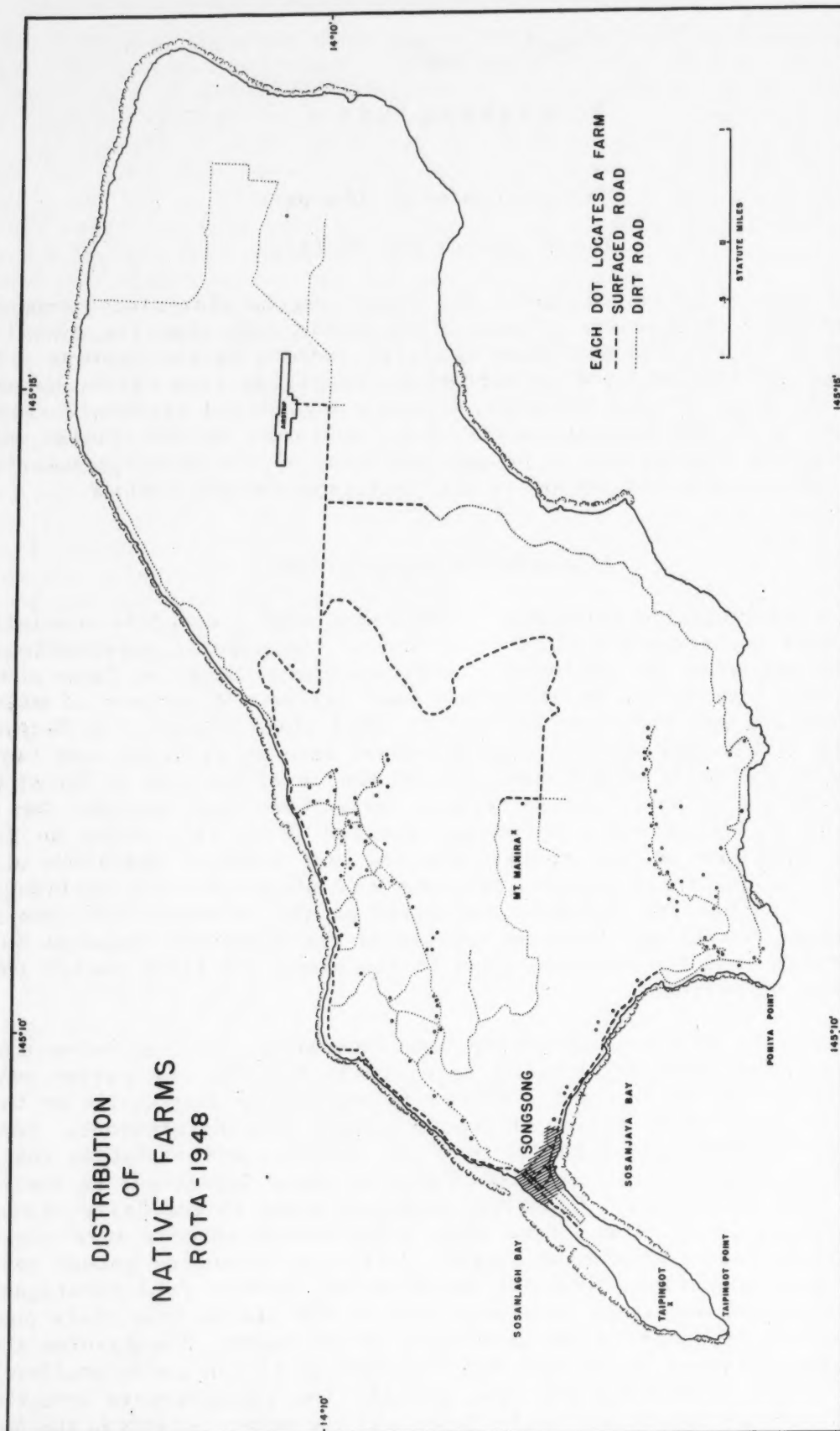


FIG. 24

American Assault

Assault on the Marianas presented a number of problems to the Americans. The southern, and most densely populated islands were 'limited land masses,' defined from a military point of view as isolated areas too small for large scale ground operations but too large to be taken by purely amphibious attack. A balance had to be determined between the mobility and striking force needed for a water attack and the staying power required for ground movement. The coasts were largely cliffed and the landing places few. The islands possessed dense civilian populations, the first encountered in the Pacific war. This necessitated provision for the quick installation of military government. Neither was it known how the total civilian population, or its various racial components, might react in the face of invasion and alien control.

The attack on Saipan, first island in the chain to come under assault, completely surprised the Japanese who expected Palau to be the next target. Landing was made on the coastal lowland, the troops advancing over the reef on June 15, 1944. Fighting progressed rapidly over the southern plateau, but was slowed over the cliffs, ridges, and wooded ravines of the northern upland (Fig. 8). Saipan was declared secure July 9th, but numerous Japanese troops remained hidden in caves. About 90 percent of the civilian population survived and came under the care of Military Government.¹ Tinian, on which attack was more hazardous because of very limited beach and the necessity of quickly moving inland to get off the narrow dangerous landings, was invaded July 24. Once American troops were ashore and the initial drive inland secure, progress was easier than on Saipan because of the less rugged terrain, and by July 31, all organized resistance was overcome. The enemy still remained, however, in isolated pockets--hidden in caves, the sugar-cane fields and the thickets of Masalog Ridge. Rota was bypassed and was not occupied until after V-J day.

After battle had passed over Saipan and Tinian, little remained but ruin. The towns, the villages, and most of the farm houses had been used by the Japanese as defense points as they retreated into more and more restricted areas. Gutted buildings, burned houses, piles of rubble and twisted sheet roofing marked the former settlement sites (Fig. 16). Fields were burned, communications entirely disrupted, and all industries completely eradicated. All the functions which had provided the islands with the necessities of life were at a standstill, and the social and economic structure which had energized these functions was destroyed. The civilians, who had sought shelter in the hills and caves during the conflict, were gradually captured or coaxed with megaphones to cross to the American lines. Many were ill, wounded, and suffering from shell shock, the strain of constant uncertainty and the lack of food and water. Assembled in stockades, they presented immediate problems requiring day-by-day solutions which precluded all long-range planning.

¹Fletcher Pratt, *The Marines' War* (New York: William Sloan Associates, 1948), p. 266.

Emergency Rehabilitation

The work which Military Government accomplished during the next few months has never been sufficiently credited. During the assault phase, from June 15 to July 9, the Marines brought together the civilians encountered in the fighting, kept them out of the way of American tactical operations, and gave whatever aid they could. Until mid-August, the period was one of emergency, during which Military Government assembled people in camps, divided them into ethnic groups, and met the problems of food, clothing and shelter. Before the end of this period, Military Government, which had been conducted by both marine and naval personnel, was transferred entirely to navy control. Many of the naval officers had already served in rehabilitation during the assault and early emergency period and, as order was achieved on the islands, great strides followed for the material and social well-being of the people.

The destruction of the towns, which Military Government had hoped might remain intact, resulted in an imperative shelter problem. During the first few days of assault, the civilians brought under the control of Military Government were concentrated at points on the beach near the former Japanese town of Chalan Kanoa. Later they were removed to a camp area between Lake Susupe and the coast. Emergency shelters were provided by salvaged Japanese tents and shacks made from scattered lumber and tin roofing from the bombed buildings (Figs. 25 and 26). With five or six hundred persons entering the stockade every day, overcrowding could not be avoided, and was increased by the accumulation of chattels which go along with human concentrations. Since each shelter eventually came to house from fifty to two hundred persons, life except for sleeping was forced outside. Here the families washed and mended clothes, ate their meals and stored haphazardly such articles as were saved from their homes. As inflow into the camps ceased, order, tidiness, and even a certain spaciousness was achieved. Goods were stored in the spaces between the roughly rowed shelters, and streets were opened throughout the area. Work on permanent housing was started under the direction of the Army Engineers. The first buildings erected measured forty by twenty feet and, after efficiency was achieved, from ten to twelve were erected in a day. This early construction was to remain occupied by the Japanese until their repatriation.

In January 1945, as housing progressed, the Koreans were moved to a new camp area. The pattern of their camp was followed in later construction to provide shelter for the Japanese who could not be accommodated in the original camp area. Six units, four 300 feet by 20 feet, and two 150 feet by 20 feet, were arranged around a quadrangle within which were located the food distribution center, a trade store, toilet facilities, fresh water supply, brackish wells and small cook houses, one for each family (Fig. 27). Because of the shortage of building materials, most of which were salvaged, crowding still continued, but life took on some degree of comfort and privacy. The housing units were divided into apartments, 20 by 15 feet each, allotted to a single family whenever possible.

In November 1944, the Chamorros and Carolinians were moved to Chalan Kanoa. A few of the buildings in this former Japanese sugar-mill town were still intact, and others could be repaired and additions made for extra space. Altogether, 117 Japanese homes which had withstood the invasion were brought



FIG. 25. Saipan: Scene in the first Korean Camp established after the end of hostilities.



FIG. 26. Saipan: Scene in the first Japanese Camp established after the end of hostilities.

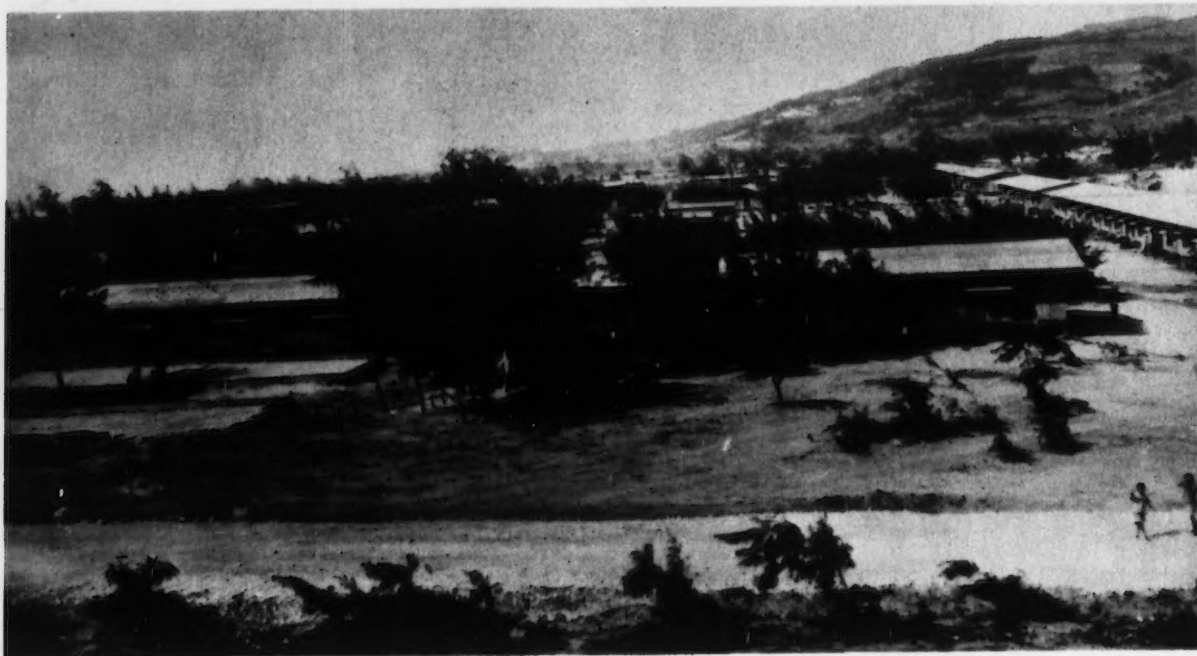


FIG. 27. Saipan: Civilian internment camp. As building materials became available, barracks were constructed to house the civilian populace. The arrangement of buildings on this particular site later conditioned the village pattern of Uleai (Fig. 47).

into use. This did not fully meet housing requirements and eighty-three four-family units were built (Fig. 28). Water was piped to the settlement, the former Japanese pipe system being used when possible. Schools were established for the various ethnic groups. Later, private homes, built from lumber salvaged by Naval Government were erected by some of the families, and some of the quadrangle units came to be occupied by only two families. On Saipan, as of September 1945, 13,954 Japanese, 1,411 Koreans, 2,966 Chamorros and 1,025 Carolinians were housed within the camp and the Chalan Kanoa area.¹

The medical facilities in the camp, like housing, passed from make-shift provisions during the assault and emergency period to well-constructed hospitals during the Naval Military Government phase. The first dispensary was a tiny thatched lean-to which was replaced as soon as possible by a more solid structure.

As the camp was extended, other dispensaries were erected, staffed by United States Navy and Japanese personnel. Patients requiring hospitalization in the assault period received attention at Platoon B of the 31st Army Field Hospital, located about three hundred yards from the civilian camp. Later

¹The term 'Japanese' included a large Okinawan group not separated statistically from the Japanese.



FIG. 28. Saipan: Type of native housing during internment period. Planned for four families. Most buildings of this type are now occupied by two families.

the 369th Station Hospital, overlooking Magicienne (Laulau) Bay, was used for civilian patients. The ultimate solution was the construction of a Naval Hospital in the midst of the camp area for the exclusive use of the civilian population. This provided three hundred beds, and at the time of construction, was the best equipped hospital on Saipan.

Water supply on Saipan presented no great problem. Slightly brackish water could be tapped easily on the lowland plan where the camps were located and yielded sufficient quantities for daily needs other than drinking. Fresh water was piped from newly drilled military wells, which supplied water to the growing American establishments.

Destruction of Japanese warehouses had exposed much food to rain. Spoilage was high; nevertheless, large quantities were saved and made available to the civilian camps. Supplies of some foods, customary to certain racial groups, were adequate for six months, but other items were so limited that it was immediately necessary to depend upon the military. Agricultural rehabilitation received first attention in order to make the camps as self-sufficient as possible and to add fresh foods to the diet. Community farms were established, each farmer receiving approximately two and one half acres to bring under cultivation. On Saipan, these were located on the coastal plain and the adjacent foothills. Here the Japanese, Koreans, Chamorros and Carolinians built temporary shacks or community huts to serve as noon-day shelters (Fig. 29). Some of these still mark the landscape; those constructed by the Koreans were particularly well made and heavily thatched with local marsh grasses. By September 1945, there were 350 plots in cultivation on

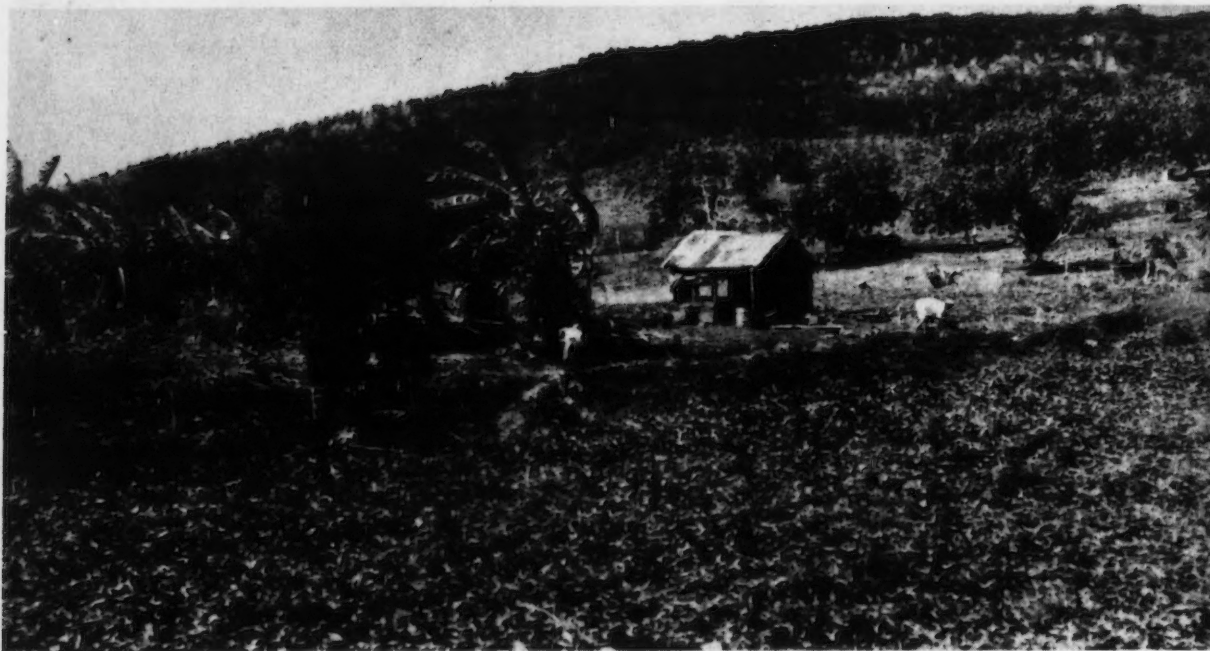


FIG. 29. Saipan: 'Noontime' house and small cultivated plot. Sweet potatoes in foreground. As soon as possible after the invasion, civilians were assigned areas for food production.

Saipan, and monthly production rose from an initial figure of 79,469 pounds of produce in September, 1944 to 286,029 pounds in September, 1945. Seeds and farm tools were gratuitous issue. Work on the farms was under armed guard. Every farm had a bell which marked the lunch period and the time for departure. At the end of a day, the farmers returned to their camp quarters behind barbed wire. An experimental farm was established on which new vegetables were tried and, if successful, introduced to the civilian farming areas. While science added to the productivity, the techniques remained essentially primitive, and the garden-like plots required the grubbing of truck farming. In addition to the output of the community farms, produce was also obtained from the pre-war farmsteads. Each day women from the camp harvested the abandoned crops, gathering several tons of produce for daily trucking to camps.

Labor was recruited from the camps on a voluntary basis, but once a task was assigned to a particular individual no unauthorized absenteeism was permitted. Most of the civilians responded happily to the need for community aid. Every day men and women left the camps, not only to labor on the farms, but also to help in the construction of American military installations. The average wage was \$.35 per day for unskilled labor, and \$.50 for skilled.¹ This remuneration enabled the civilians to make purchases of small needs at the trade stores established in each camp.

¹This compared with two and one half yen, or approximately \$.57 per day, the average wage paid by the Japanese for native labor (1937). To the American figure must be added food, clothing, housing and medical attention.

Fresh meat supplies were limited and were supplemented by canned products. Farm animals which escaped during the conflict, roamed the hills and were greatly reduced in numbers by the Japanese soldiers. Those captured by the Americans were rounded into corrals and slaughtered for the provision of the camps. The cattle were easily taken. On Saipan, as many as 550 occupied the corral at one time. Fish also added to the diet. The fishing industry was completely wrecked during the fighting; the boats were sunk in the lagoon or destroyed by fire on the beach. Once rebuilt, fishing operations for bonito and tuna were resumed by the Okinawans who had conducted the industry before the war. Within the reef, a limited catch was made by the Carolinians with nets and spears.

The trade stores were first operated by Military Government, but were later taken over by cooperatives. Civilians were also permitted to set up private enterprises. Importation of trade goods at first rested with Military Government, but later was assumed by the United States Commercial Company which, in cooperation with the Naval Military Government, took charge of agriculture, handicraft, and other economic activities.¹

In every camp, handicraft and light industry were initiated. Cobbler shops, smithies, potteries, shoyu and miso factories, soap factories, sewing centers and carpenter shops supplied daily necessities for camps and farms, and items for sale to troops desiring souvenirs. Many of the workers were experts, discovered in an analysis of skills conducted by the labor office. Handicraft was an organized industry producing mainly for commercial sale to soldiers and sailors on the islands. Making pandanus mats and baskets, wood carving, weaving, manufacturing of silver jewelry, besides providing an income, also served a social end by utilizing the energies of persons otherwise unemployed. The products made were distributed through roadside stands, shops, stores and army post exchanges.

The story of civilian disruption and rehabilitation on Tinian followed the general pattern of that on Saipan, varying only in detail. The day the

¹The United States Commercial Company, originally administered by the Board of Economic Warfare (later Office of Economic Warfare and Foreign Economic Administration) and later transferred to the Reconstruction Finance Corporation, operated not only in the Pacific Islands but also in Japan and certain other western Pacific zones. 'Started in late 1945, it devised programs to establish island trade, to revitalize agriculture, and to replenish livestock and poultry. The policies for specific economic activities were formulated for Military Government jointly with the United States Commercial Company and these policies were to be effected by the United States Commercial Company. To implement the over-all policy of getting the islanders to take more active part in their own economy, the following steps were to be taken: (1) Surplus local goods were to be purchased by the United States Commercial Company in order to provide a source of income for the islanders; (2) Consumer goods will be provided through sale by the United States Commercial Company in order to provide a source of supply to the islanders; (3) The United States Commercial Company will stimulate local enterprise by providing at low cost capital goods and durable consumer goods in order to facilitate the establishment of local businesses.' (U. S. Navy Department, Office of the Chief of Naval Operations, *Handbook on the Trust Territory of the Pacific Islands* [Washington: Government Printing Office, 1948] p. 129).

fighting ended, in the middle of the rainy season, 1,500 civilians had been huddled together under canvas shelters pitched in the mud. By the end of August, this number had increased to 11,827, of which 9,306 were Japanese, 2,517 Koreans and 4 Chinese. As rapidly as possible, the main camp was constructed at Churo and another on a small cove just northwest of former Tinian Town. This was occupied by a small number of Okinawans who operated the fishing program. Camp buildings, allotted on a family basis, were smaller than those on Saipan, having been set up as single units. The farms on Tinian were first organized on a communal basis but were later divided into plots after the Saipan manner. By September 1945, 357 acres were in production.

Rota presented a somewhat different story. Although the island had never come under direct landing attack, effective bombing had almost completely destroyed facilities. All of the villages had become uninhabitable early in 1944 and the islanders lived in caves or shack-like shelters hidden in the trees. After American occupation, September 4, 1945, the Japanese, Okinawans and Koreans were maintained in hastily constructed camps on the sites of the former villages. The natives were brought together in three temporary villages: Onginao on the northwest coast, AsMaleté on the south coast, and Songsong on the isthmus. Shortly after American occupation, a typhoon passed directly over the island, contributing further to the ruin. Materials were brought from Saipan and Tinian for reconstruction and a village for the total native population was built at Songsong, on the traditional Chamorro village site at the northeast end of the isthmus. The natives were permitted to work their farms and to supply their families directly instead of through a food distribution center. Gratuitous issue of food however was necessary because of the destruction of field crops by the typhoon. Malnutrition on Rota was not as great as had been expected by Military Government authorities; the Japanese military garrison had been smaller and there was less pressure on food supply. Water presented no problem since the natural springs in the volcanic zone provided an adequate supply and the piping had been little disturbed by bombing.

American Military Occupance

When the Japanese nationals were removed in January and February of 1946, only Saipan and Rota were left with native populations. All three islands were occupied by American personnel. Simultaneously with the rehabilitation of the natives and continuing up until V-J day, military construction had progressed rapidly on Saipan and Tinian in expectation of the attack on Japan. Airfields, roads, wells, communications, barracks and all the other installations of a staging area had changed the landscape from the ruin of battle to a bustling military camp.

Patterns of military occupance dominated both Saipan and Tinian. On Tinian, camps were built to house 50,000 troops giving a military density of 1,282 per square mile, as compared to 256 under the Japanese. The entire northern end of the island became a B-29 field, the largest in the world. A second airfield was constructed near Gurguan Point and the former Japanese field located nearby was reconditioned and brought into use. Tank farms with a capacity of approximately 6,930,000 gallons of aviation gasoline, 840,000

gallons of motor gasoline and 590,000 gallons of diesel fuel were established. Miles of pipelines connected the fuel storage areas and extended to the harbor and the airfields. Seventeen new wells were dug, supplying 1,500,000 gallons of water a day. Two hospitals were constructed. Miles of roadway were laid; some of the highways were dual lane, cement covered and quite in contrast to the former dusty Japanese roads. Because of the general resemblance to the island of Manhattan, newly constructed roads in Tinian were named after the streets in New York City. Huge coral pits were operated day and night to supply needed materials for roads and airfields. Binding and surfacing was provided by asphalt plants. Countless shops and warehouses were needed. Ammunition dumps were established, located whenever possible in the more isolated sections of the island. Recreation requirements dotted the island with clubs, outdoor movies and beach facilities. Religion also added its element to the landscape; fifty-two churches served the military community. The pattern on Tinian was repeated on Saipan: both islands becoming staging areas for the expected attack against Japan.

The development of Tinian would have been impossible without the improvement of dock and harbor facilities. Under the Japanese, Garapan had received first attention as a port, and no more work had been done on Tinian than was necessary to meet the requirements for the shipment of sugar. The harbor was only a shallow lagoon enclosed within a discontinuous line of reef. Two small cement piers cared for light craft and all large vessels anchored offshore, dependent upon lighters. The limited Japanese port facilities were inadequate for American needs; convergence of lighter and vehicular traffic in the small port area hampered the unloading and distribution of supplies and delayed military construction on the island. Nor was there sufficient protection for ships during stormy weather. As a result it was necessary to enlarge the harbor area and expand the port facilities. The first piles for a breakwater were driven in November 1944 and within a period of five months large ships could be docked. The harbor channel has been dredged to 30 feet, and the docking area, with berths for eight ships was dredged to 27.

Under the program of military development, Foreign Economic Administration (F.E.A.) units were organized on both Saipan and Tinian. While the other military activities were consumers, F.E.A. conducted a productive program to supply the troops with fresh fruits and vegetables. On Tinian, American military personnel, aided by civilian internees from the camps, cleared 1,300 acres in Marpo Valley, at Hagoi, and at other points on the island, and had 850 acres under cultivation by April 1945. Operations were hazardous because tons of ammunition littered the surface. Tank traps, wire entanglements, fox holes and command posts had to be eliminated. From the beginning of operations in January 1945 to August of the same year, 1,250,000 pounds of truck crops were produced, all of which was consumed on the island except for several tons of corn shipped to Iwo Jima. On Saipan, F.E.A. operations followed the same pattern but were on a smaller scale.

Revolution in Landscape

By the end of the war, a complete revolution in landscape had occurred. Out of the ruin of the Japanese agricultural pattern of small settlements and

a regional tempo dependent upon the seasons, had grown a military camp, harboring force necessary for the attack on Japan (Fig. 30). The environment had been quickly adapted under the Americans to changing world conditions, and the tempo of the region deliberately and systematically quickened. The natives, bystanders in an event not of their making and which they did not fully understand, contributed only a limited amount of labor to the transformation. Not since the early Spanish period had war touched them so directly. Neither the Germans nor the Japanese had come with destruction nor followed their arrival with so quick a change. The end of the war brought repatriation of the Japanese. Withdrawal of the American troops left a landscape cluttered with abandoned installations and piles of waste (Figs. 31, 32, 33). Out of this a new way of life was to be built, but neither native thinking nor the landscape could be quickly brought to order. Aided by the officers of Civil Administration, the people began the work of reconstruction, seeking solution to the many problems confronting them as they sought to regain their former standard of living.



FIG. 30. Saipan: American military installations. Most of the buildings still remain. View on Kagman Peninsula, Mt. Tapotchau in background.



FIG. 31

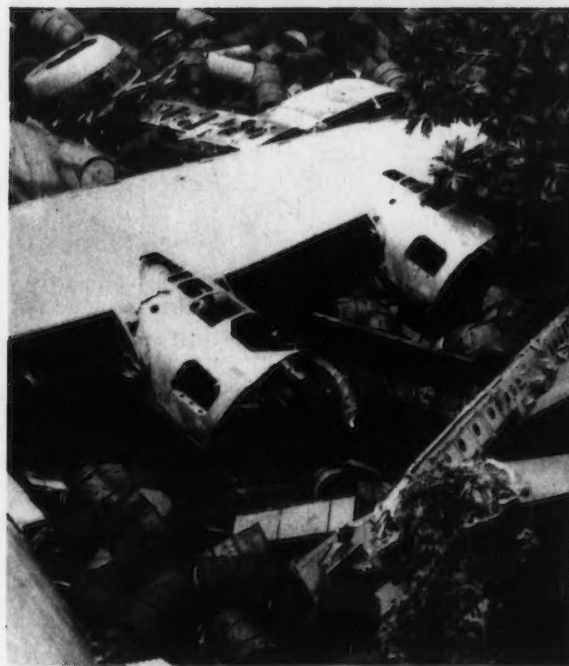
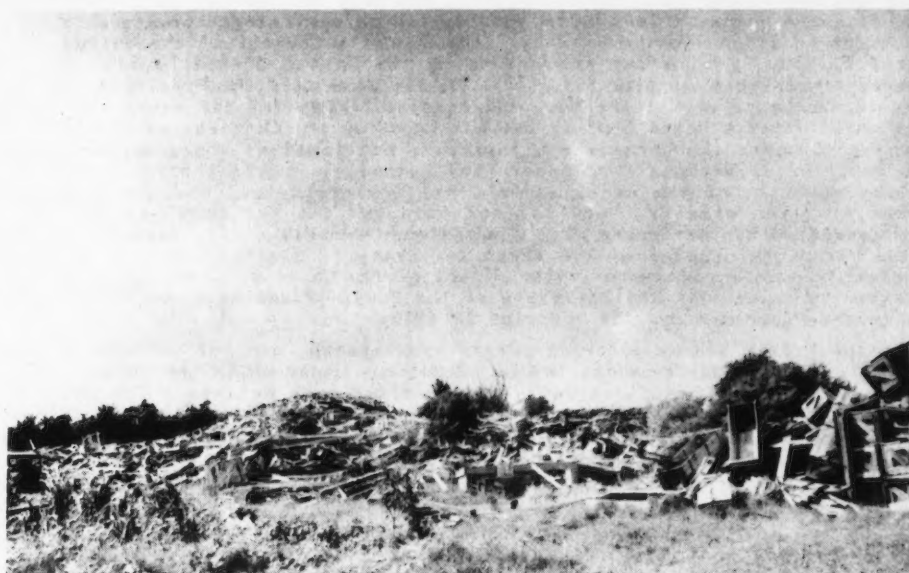


FIG. 32



FIGS. 31, 32 and 33. Saipan: The waste of war. Some wreckage was collected and piled in dumps, but much remained scattered over the landscape.

CHAPTER IV

Reconstruction of Landscape

Some Aspects of the Problem

Following American acquisition, the islands were placed under Naval Military Government in accordance with the laws of belligerent occupation.¹ This terminated July 18, 1947, when the former Japanese Mandated Marianas were organized as the Saipan District of the Trust Territory of the Pacific Islands under Naval Civil Administration (Fig. 34).² Under the trusteeship agreement, the United States has been given full powers of administration, legislation, and jurisdiction;³ and has assumed responsibility to foster self-government, and to promote the economic advancement and self-sufficiency of the inhabitants.

¹A number of agreements were reached in regard to the Pacific islands before the end of the war. The Cairo declaration of December 1, 1943, stated that Japan was to be stripped of her Pacific possessions. This was later reaffirmed at Potsdam, July 25, 1945, and incorporated into the terms of surrender submitted to the Japanese, September 2, 1945.

²Soon after the end of the war, the State, War, and Navy Departments developed a draft proposing that the former Japanese Mandated Islands be established as a strategic trusteeship to be controlled by the United States under the United Nations. The Security Council of the United Nations approved the draft, April 2, 1947, and, after acceptance by the United States Senate, the United States government assumed trusteeship on July 18, 1947. On the same date the President, by Executive Order 9875, delegated to the Secretary of the Navy the responsibility for the civil administration of the Trust Territory on an interim basis pending the enactment by the Congress of organic legislation for the area. Saipan, as under the Germans and Japanese, continues as the governmental center of the district. The district is administered under dual authority: by a governor, concerned primarily with the military security of the area, and a Civil Administrator, who, in cooperation with the natives, directs civilian affairs. General policies for the Marianas, as for the entire Trust Territory, are formulated by the Deputy High Commissioner and his staff, formerly at Guam but now at Truk, and by the High Commissioner of the Trust Territory in Hawaii. General supervision is provided by the Island Government Division in the Office of the Chief of Naval Operations in Washington, and ultimate authority rests with the Secretary of the Navy. Plans have been formulated to transfer responsibility to the Department of the Interior in 1951.

³As held by the United States under strategic trusteeship, control differs in several respects from that of the Class C Mandate from the League of Nations under which the islands were administered by Japan. The most important modification is that dealing with defense. The whole of the Pacific Trust Territory is designated as a strategic area, and the United States holds administration under (Footnote continued on following page)

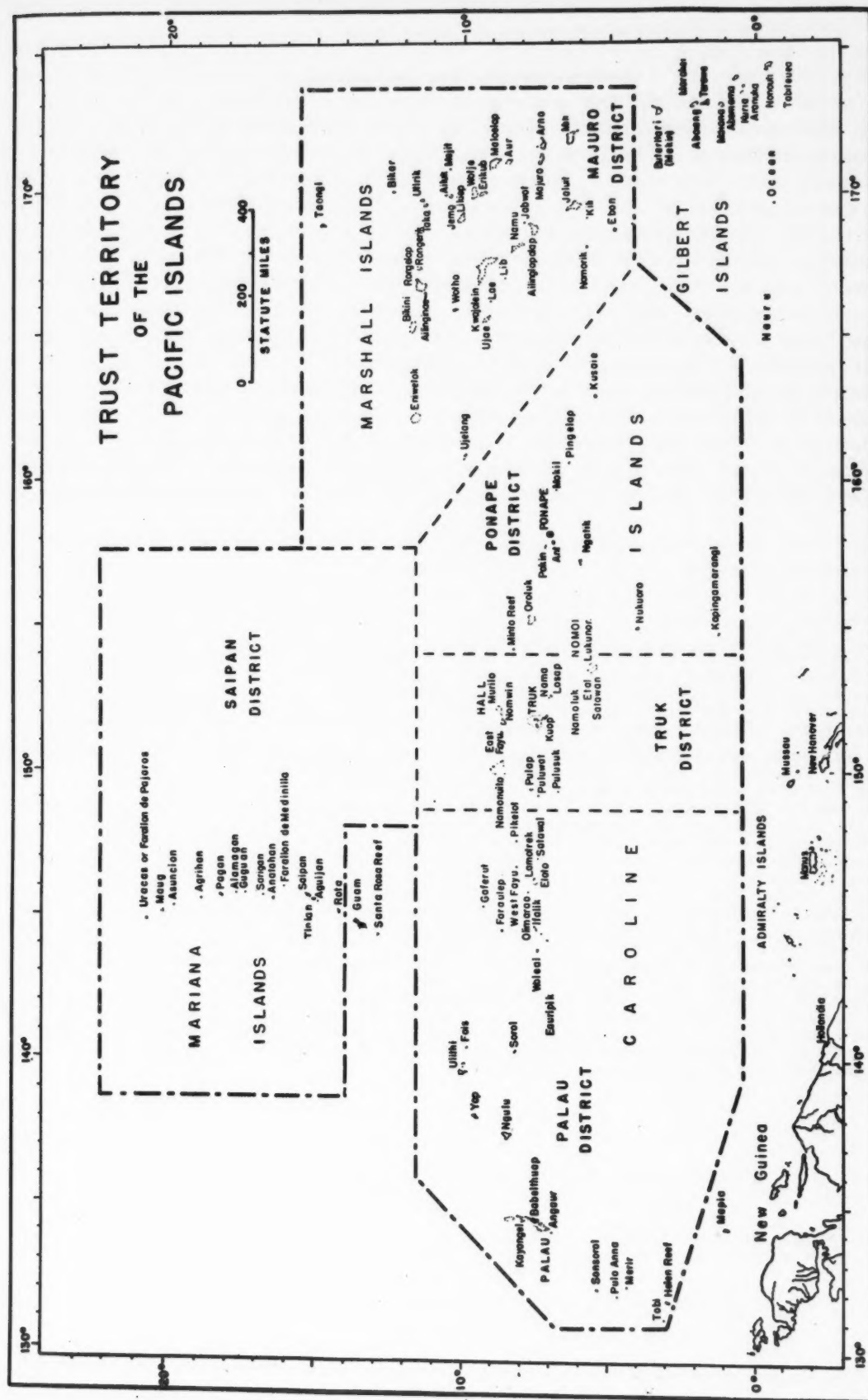


FIG. 32.

One of the basic objectives of American administration throughout the Trust Territory is the establishment of a balanced economy based on local resources which will enable the natives to attain a standard of living at least equal to that existing prior to World War II. The accomplishment of this end in the Northern Marianas is probably the most difficult problem faced by Civil Administration in the area. Both human and natural resources are limited. The prewar standard of living was among the highest of any of the native peoples in the former Japanese mandated area; it resulted primarily from Japanese commercial activity rather than from native efforts. The economic development needed to restore the former level of private and public welfare requires a background and experience lacking in the present population group. The immediate problems of economic rehabilitation have been met by American administration, and general policies formulated for the long range economic development of the area,¹ but attainment of the desired objective will require a long period of time. The pages which follow present an evaluation of the resources and their utilization in relation to subsistence and commercial production, record the progress toward recovery made up to the present, and give consideration to the possibilities of further commercial development.

(continued from preceding page) the jurisdiction of the Security Council rather than the General Assembly. The islands may be fortified (Article 5, *Trusteeship Agreement for the Former Japanese Mandated Islands*) and their manpower and resources used to aid the Territory in the maintenance of international order (Article 84, *Charter of the United Nations*). All members of the United Nations are to receive equal social, economic and commercial treatment within the area, but not to the detriment of the inhabitants or of world peace (Article 76, *Charter of the United Nations*).

¹An outline of economic policy as formulated in a communication from the Chief of Naval Operations to the governor in April, 1947, lists the following as basic objectives: '(a) Developing throughout the area a balanced economy through the full utilization, in accordance with sound conservation and for the benefit of the local inhabitants, of the natural and other resources to meet local needs as well as to provide payment for goods and services which must be imported into the area. (b) Assisting the local inhabitants in assuming a maximum of responsibility for their own economy and preventing their economic exploitation by either local or outside interests. (c) Establishing standards of living for the local inhabitants at least equal to those existing prior to the war with Japan. (d) Assisting the local inhabitants, insofar as feasible, to become qualified for and to obtain employment in all occupations, employment and professions adapted to the area with out discrimination. (e) Providing agricultural tools and implements, seeds, fertilizers, insecticides, fishing gear, trade goods and other essential supplies, including materials required for housing, education, and welfare, to carry out the basic economic policy. (f) Authorizing the development of trade stores for the sale of merchandise in cases where normal distribution channels are inadequate. Encouragement is to be given to the reconstruction of normal trade channels by providing opportunity to local traders and trade organizations to establish private distribution channels. The access which such traders have to outside public or private sources of civilian supplies is, however, to be controlled by the military governor so as to advance the objectives stated above' (U.S. Navy Department, *Handbook on the Trust Territory*, p. 128-129).

The Human Resource

Since people are the final element in the landscape, executing the techniques by which natural resources are brought into production, planning for successful economic development must give full consideration to the nature of the human resource. Total number of people, rate of increase, age, sex, and racial composition, and the skills, culture, and psychology of the population are factors in both the present and potential reconstruction of the area. Education enters as a conditioning factor, modifying the views of the people and opening new avenues of land use.

As recorded December 31, 1949, the native population of the Saipan District was 6,225.¹ Although American personnel remain on Saipan, they represent a fluctuating transitory group whose numbers are dependent upon the international situation. This group at present is being steadily reduced. It cannot be considered a constructive labor force; its needs are almost entirely supplied from the United States, and at best it represents only a limited, uncertain, and at present, declining market for local produce and labor.

The native population divides into two groups, of which the Chamorros are predominant. As of August 31, 1948, the Carolinian segment numbered 1,074, representing about 18 per cent of the total population.² As a group, the Carolinians show less acculturation and maintain a lower standard of living than the Chamorros. Their lives and activities are somewhat more spontaneous and their aspirations more vague and indeterminate. Since they tend to segregate in separate districts in Chalan Kanoa or to congregate in certain villages, like Tanapag, they have a political voice through representation that would be lost if they were scattered throughout the several voting districts. Intermarriage with the Chamorros is infrequent. In a sense, the Chamorros view the Carolinians as they themselves were once viewed by the Japanese. Relations between the two groups are worked out smoothly in spite of minor undercurrents of feeling.

The small population limits the present development of the area and the achievement of a standard of living comparable to that maintained before the war. Under the Japanese, 46,708 persons inhabited the Saipan District.³ Their total labor output and accumulation of wealth and tools over a period of thirty years' occupancy supported a higher standard than can now well be

¹U. S. Navy, Trust Territory of the Pacific Islands, Civil Administration Unit, Saipan District 'Quarterly Report for Activities during the Period, Oct. 1 - Dec. 31, 1949' (Saipan: 1950) (mimeographed).

²Tabulated from statistical records at Civil Administration office, Saipan. Since January 1, 1948, Carolinians have not been distinguished from Chamorros in the Quarterly Reports, the population being designated as Saipanese, Tinianese, or Rotanese.

³1937 figure. U. S. Navy Department, *Mandated Marianas Islands*, p. 35.

maintained by a group of 6,255 (Fig. 35). If to the small productive capacity of this group are added isolation, cost of transportation, and other geographic and social problems linked with successful rehabilitation, the problem of reconstruction increases many times over in its complexity. The present population is limited in capital, in tools of production, and in capacity for the possible avenues of resource development. There are too few people for the land; the population must grow into the area and be educated to the area.

The problem becomes more pointed as one considers the smallness of the effective population. If all children under sixteen, all adult females, and all males over fifty-five are deducted from the total population, there remain some 1,472 persons who may be counted as effective. While it is true that the women and children add to the labor output, their contribution is minor as compared with that of the male group between the ages of sixteen and fifty-five. Upon this group must fall the major task of supporting the population and maintaining whatever standard is achieved. In addition to the handicap imposed by the small size of the labor force, the effective population is scattered; Saipan has the largest concentration with 1,112 persons; Tinian has 97; Rota, 181; Alamagan, 38; and Agrihan, 44. On Saipan a part of the effective population is employed at American installations. This represents a loss to the creation of economic productivity, since the development of resources must compete with wage-earning possibilities. While American personnel are being withdrawn and the opportunities for native employment rapidly reduced, as of August 23, 1948, 944 persons were reported as full time workers.¹ Deducting the 133 women included in this number and subtracting the amount from the effective male population leaves only 811 workers in the entire area whose energies could be applied to agriculture and other forms of land use on the given date.

It is difficult to determine what labor loss may occur to the district as a result of emigration, since movement between the Saipan District and Guam is insufficiently documented over any length of time. The number of persons entering and leaving the district varies considerably from month to month; in the first three months of 1949, 195 persons either departed to or returned from Guam, with a final net loss of 9 to the Saipan District. Much of this travel is for visiting friends and relatives, some for attending school, and part for seeking employment. Most of those who secure work regard their employment as temporary and plan to return to their homes as soon as a desired sum of cash is accumulated. As a result, a certain amount of discrimination has grown up in Guam against district labor as being undependable, transitory, and desirous of frequent leaves to visit families at home. Whatever the extent of the labor migration, it arises from a lack of opportunity resulting from the undeveloped state of resources and transportation, and represents a loss of needed energy in the Saipan District.

¹U. S. Navy Department, Trust Territory of the Pacific Islands, Civil Administration Unit, Saipan, 'Daily Labor Report, August 23, 1948' (Saipan: 1948). A later undated report, received April 1, 1950, lists 682 persons as employed by military and private enterprises.

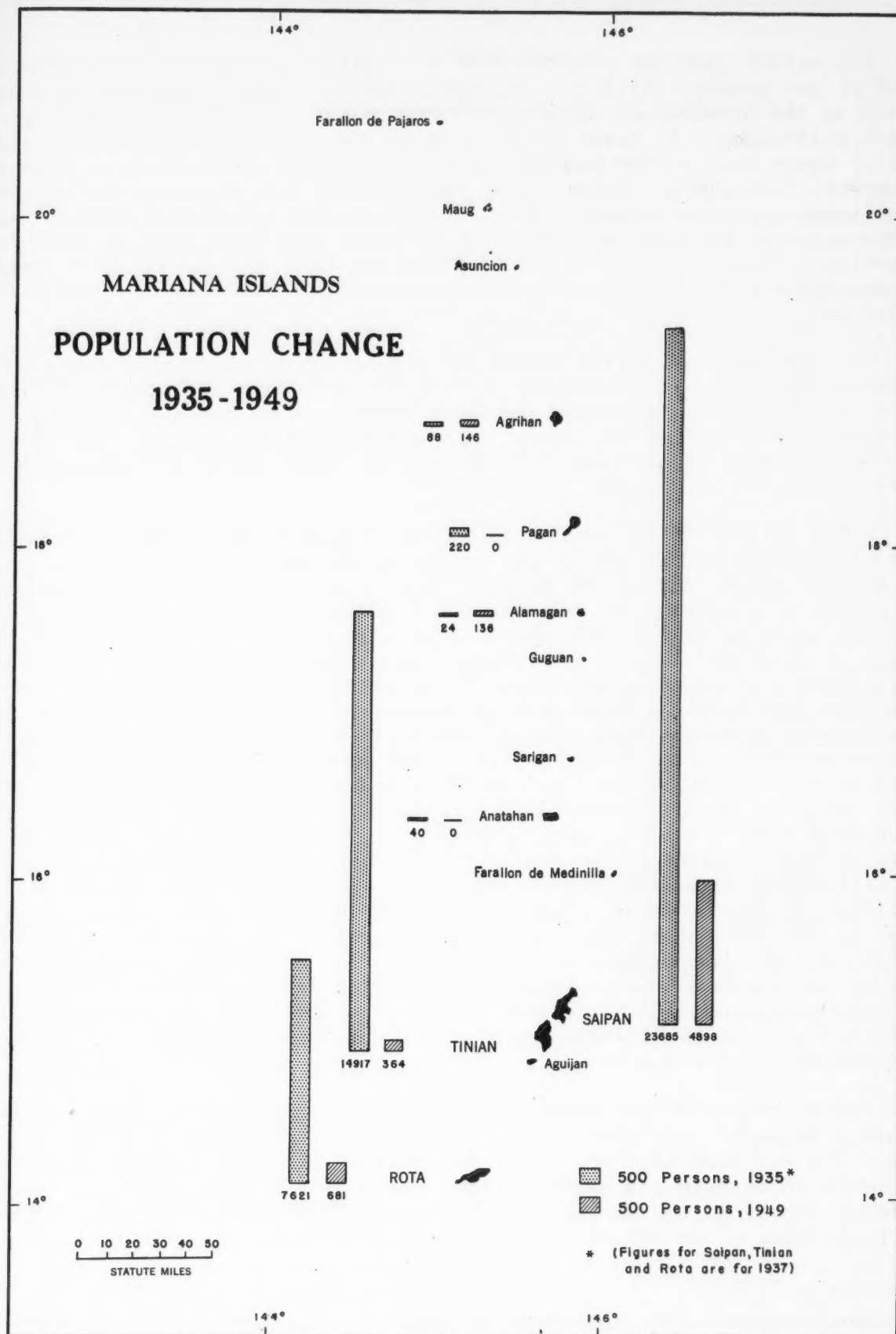


FIG. 35

The native attitude towards labor is highly critical and evaluative in terms of the benefits received. The performance of labor beyond the need for income or the achievement of a particular desire runs somewhat counter to native philosophy. At least 75 per cent of the natives rented the greater part of their land in the Japanese period, retaining only enough to provide a domestic food supply. Other income was obtained from seasonal, and in some cases permanent, employment. The majority regard employment rather than development of the land as affording the best possibilities for economic advancement. This attitude has been intensified since the war by their seeing certain members of the community attain desired ends quickly by working for Americans.

The wide range of skills within the population group, ranging from trades to the professions, is indicative of inherent ability. This range is wider among the Chamorros than among the Carolinians; thus, out of a list of 333 Saipanese classified as 'artisans,' by the Labor Office of Civil Administration only 45 were Carolinians and only one of these was on the professional level (Table 4).

Other factors which require attention in regard to the native development of the area include the energy output as related to health and diet, and the general psychology of the people. The common Japanese attitude towards the native as a laborer was expressed by Yanaihara who explained the need for Japanese immigration into the Marianas on a basis of 'the inability of the native to be of satisfactory service in the advanced methods of sugar cane cultivation and sugar manufacture.'¹ Opinions of the same general nature have been expressed by Americans in regard to both the Chamorros and the Carolinians, although reports to the contrary are not lacking. Some of the criticism of the natives as uncooperative and ineffective arises from language difficulties. Also, during the period of American military occupation, the great need for labor necessitated the employment of natives at tasks for which they were often not well trained and in some cases were ill-fitted. Those who had acquired skills during the Japanese period performed effectively and efficiently after the initial period of adjustment. With education, the abilities of the islanders compare well with those of other peoples. Previous to the war, native labor was largely supervised, and in only a few isolated cases were management abilities required. While the islanders were a part of the economic system established by the Japanese, their efforts were contributive rather than directive, and as a result, they are at present ill-qualified to take the initiative in organizing production for the economic reconstruction of the area.

Energy output of the native worker as related to health requires study before a definite statement in regard to the effectiveness of labor can be made. The war disrupted the usual patterns of life and created conditions conducive to disease and malnutrition. According to Gallahue, who made an economic survey of the Marianas in 1946, the labor output in some respects was below that of the United States, but the debilitating effects of chronic

¹Tadao Yanaihara, *Pacific Islands under Japanese Mandate* (New York: Oxford University Press, 1940), p. 61.

TABLE 4
SKILLED WORKERS REGISTERED AT THE SAIPAN LABOR OFFICE
JUNE 30, 1947^a

	<i>Chamorro</i>	<i>Carolinian</i>	<i>Total</i>
Carpenters	41	14	55
Nurses	37	1	38
Plumbers	8	0	8
Painters	6	3	9
Blacksmiths	6	0	6
Draftsmen	4	0	4
Telephone Operators	5	0	5
Cooks	10	0	10
Electricians	14	0	14
Hospital Technicians	5	0	5
Mechanics	104	18	122
Heavy Equipment Operators	18	3	21
Barbers	9	3	12
Dentists	4	0	4
Machinists	3	0	3
Radiomen	1	0	1
Cobblers	5	3	8
Silversmiths	8	0	8
Total	288	45	333

^aU. S. Navy, Civil Administration Unit, 'Quarterly Report, April 1 - June 30, 1947.

disease and improper diet were not appreciable.¹ Records from the Japanese period are too inadequate to permit comparison with the present.² Reports to the League of Nations indicate that the incidence of respiratory, intestinal, and skin diseases was high among the native populace. This trend has continued, tuberculosis in particular having been shown by health examinations to occur with high frequency.³ Civil Administration is fully alert to the problem of health in the area and is following a vigorous health and sanitation program. Their problem, however, has been extreme because the general health of the islanders was poor at the time of occupation due to wartime diet, meager medical attention during the war, and exposure during the period of American attack.

Energy output and diet have received very little scientific study in the Marianas. No quantitative dietaries have been obtained, and qualitative statements have proven so inaccurate as to be practically valueless. Under foreign rule the islanders, especially the Chamorros, have become accustomed to a wide variety of foods, including many imported items. Rice is a staple item in the daily consumption pattern. It is likely that the native diet has been overly high in carbohydrates and generally deficient in protein for generations, but no deficiency diseases such as beri-beri, pellagra, or scurvy are encountered. The high incidence of conjunctival abnormality may arise from nutritional deficiency, but opinion is somewhat divided on this possibility. The greater part of the protein intake is supplied by fish, but these are not secured in sufficient quantities for daily serving. Meat is a luxury; some families report its use only once a month, a situation arising from the depletion of livestock during the war and the present need for thriftiness in building up herds and flocks. Education to a wiser use of locally grown foods is definitely needed, also the introduction of enriched foods in the stores. While the diet is less than optimum, nutritional deficiencies are not greater than those of many other peoples. Nevertheless, the problem is one requiring further study and a definite drive towards correction.

Psychological data on the native population is so limited that it is impossible to make any positive statement as to the mental health of the adult population and the resultant influence on labor output. There is evidence in some cases of feelings of insecurity, anxiety, and retreat, as expressed by avoidance of direct statement of opinion when in contact with

¹Edward E. Gallahue, *The Economy of the Marianas*, Vol. V, *An Economic Survey of Micronesia* (Honolulu: United States Commercial Company, 1946), p. 17. (Mimeographed.)

²Almost all the local records were destroyed at the time of the American attack.

³Mortality statistics indicate that tuberculosis is by far the leading cause of death among the natives of Saipan. During the period since January 1, 1948, 54 per cent of the deaths among natives on Saipan has been due to tuberculosis....natives with tuberculosis do not seek treatment until the disease is far advanced or terminal.' (U.S. Navy, Civil Administration Unit, 'Quarterly Report, April 1 - June 30, 1948.')

Americans.¹ Undoubtedly, this is based in part on centuries of administration by foreign powers. Again, the war enters as a problem, making it difficult to trace psychological attitudes because of the disruption of the usual culture patterns. Joseph and Murray indicated numerous repressions and psychological attitudes among the children, which, if carried over into adulthood, would make difficult the solution of many problems of reconstruction and resettlement.²

While the present situation is one of limited labor supply, the natives of the Marianas are the most rapidly expanding group in the Trust Territory. Thus planning must recognize the present situation as one of underpopulation;

¹Numerous persons, when asked to give their opinion as to some particular policy of land utilization, replied that it was not for them to express an opinion, but rather the responsibility of the Americans to decide and that of the islanders to comply.

²The work of Joseph and Murray showed the following personality abstract based on examination of 200 Saipanese school children:

- (1) 'Psychological handicaps, with perhaps consequent lowering of the individual's energy output and resistance to mental and emotional stress.
- (2) Slow psycho-motor reactions.
- (3) Underdeveloped or unutilized abilities for abstract thinking on a basis of generalized anxiety and overwhelming personal preoccupations.
- (4) Increased attention for the dangerous immediate situation, with extremely skillful, but predominantly imitative, mental adaptation to it.
- (5) Increased practical planning without, however, sufficient objectivation through abstract thinking, and therefore falling short of long range social planning.
- (6) Minimal use of creative faculties.
- (7) Strong, but vague aspirations.
- (8) Emotional insecurity and egocentricity. Decreased spontaneity and inhibitory and repressive trends in the Chamorros, little controlled, impulsive affectivity in the Carolinians.
- (9) Marked anxiety, based largely on feelings of inadequacy and suppressed hostility, and giving rise to mental and emotional confusion.
- (10) A defense pattern, mainly consisting of outward submission and conformity, with relatively little development of true escape mechanisms (evidence of surface-adaptation).'

(From a preliminary draft of manuscript prepared by Doctors Alice Joseph and Veronica Murray as a part of their work as members of the Coordinated Investigation of Micronesian Anthropology (CIMA), conducted by the Pacific Science Board and the U. S. Navy, 1947-1948.)

but, in long range terms, consideration must be given to the possibilities of overpopulation. Annual native birth rates in the Saipan District for the years between 1924 and 1937 varied between 35.8 and 47.4 per thousand. Annual death rates for the same period were between 21.8 and 49.5 per thousand.¹ The average over this fourteen-year period is a birth rate of 40.3 per thousand and a death rate of 24.7, or an average annual increase of 15.6 per thousand. On an ethnic basis, the Chamorros are increasing at a higher rate than the Carolinians.² The Japanese attributed this to a greater acculturation among the Chamorros and better adjustment to the socio-economic system introduced into the area. Since the war, birth rates have increased and death rates declined. The birth rate for the total population in 1947 was 58.2 per thousand and the death rate 20.3 per thousand.³ In 1948, the birth rate on Saipan was 46.3 per thousand and the death rate 20.3 per thousand.⁴ It is probable that both the birth and death rates will more nearly approach the prewar figures within the next few years. The high birth rate since the war is explained in part by an increase in the number of marriages following the disruption of normal life by the war. The war years also eliminated many of the aged, thus reducing the present death rate.

Both biologic and social factors point to a strong reproductive potential. The Chamorro and Carolinian segments show age profiles characteristic of youthful populations. Forty-six per cent of the Chamorro population are in the reproductive group between the ages of fifteen and fifty, and 41.1 per cent are under fifteen years of age. Among the Carolinians, 54.2 per cent are between fifteen and fifty, and 36.6 per cent under fifteen. The sex ratio for each group is fairly even, showing only a slight overbalance on the masculine side. Custom in the area, strongly influenced by Catholicism, favors large families. Children are desired and appreciated. Since the American occupation, nearly all babies are born in hospitals, thus reducing infant mortality. Continued work on health and sanitation, already vigorously initiated by Civil Administration, will reduce the death rate and raise the general status of the people. Assuming that present rates will level off

¹U. S. Navy Department, *Mandated Marianas Islands*, pp. 36-37.

²During the Japanese period, the annual birth rate ranged from 38 to 43 per thousand and the annual death rate from 16 to 25 per thousand. The Carolinian birth rate was from 32 to 37 per thousand and the death rate from 26 to 35 per thousand. U. S. Navy Department, *Handbook on the Trust Territory*, p. 56.

³Based on data from U. S. Navy Department, *Handbook on the Trust Territory*, p. 57.

⁴Based on data tabulated from statistical records at the Civil Administration Office, Saipan, and materials from the 1948 quarterly reports from the Saipan District. Complete statistics were not available for Tinian and Rota for 1948.

slightly above the prewar level, we may conclude that the population of the Saipan District will double itself in about forty-four years. A similar biological trend is to be noted among the natives of Guam following American acquisition of the island.¹

The People and the Land

The casualties of war and the repatriation of the Japanese removed seven-eighths of the population from the Northern Marianas, leaving the natives as the dominant occupant group. The relationship between the people and the land is one of underpopulation (Figs. 36 and 37), reflected in the landscape by wide tracts of unused land and an inadequacy of public and private facilities for full community life. In one respect the area resembles a frontier; there are too few hands to fully utilize the area or to support the desired level of public welfare. The total population, numbering little more than that of a small American town, is distributed on five islands arranged along a distance of 290 miles. Nowhere except on Saipan, and there only relatively so, are aggregate numbers large (Table 5). The present population, both in numbers and distribution, is in striking contrast to that of the Japanese period, well illustrating the limitation of the human resource and the problem of achieving with 6,225 people a standard of living formerly maintained with 46,708 (Fig. 35).

Although the total area is underpopulated, both Alamagan and Agrihan now carry more inhabitants than during the Japanese regime. Since the Japanese carefully surveyed all resources and planned accordingly, it is possible to assume that these islands are now overpopulated, and that the inhabitants may not be able to attain a standard above the subsistence level with the present methods of land use. This is especially true if the price of copra falls, as income is derived primarily from the harvesting of coconuts.

While the total population figures are of significance in determining the relationship between the people and the land, still more meaningful are the man-land ratios, particularly when interpreted in relation to the low technological level of production among the natives (Tables 6 and 7). The underpopulation situation becomes more pointed when one considers the ratios between effective population and arable land for the three islands under study. The average native farm consists of about 3.24 hectares (8.02 acres). As can be determined from Table 7, each effective worker on Saipan would have to bring the equivalent of one and one-half native farms into production if the island were returned to its former cultivated extent with the present population. On Tinian and Rota the situation is more extreme; each effective worker on Rota would have to bring under cultivation an area equal to about six farms and the worker on Tinian, an area of twenty-two farms. Even were this possible, production would not reach prewar levels because of the

¹ 'During the American regime, the native population of Guam has increased over 120 per cent' (Thompson, *Guam and its People*, p. 37).

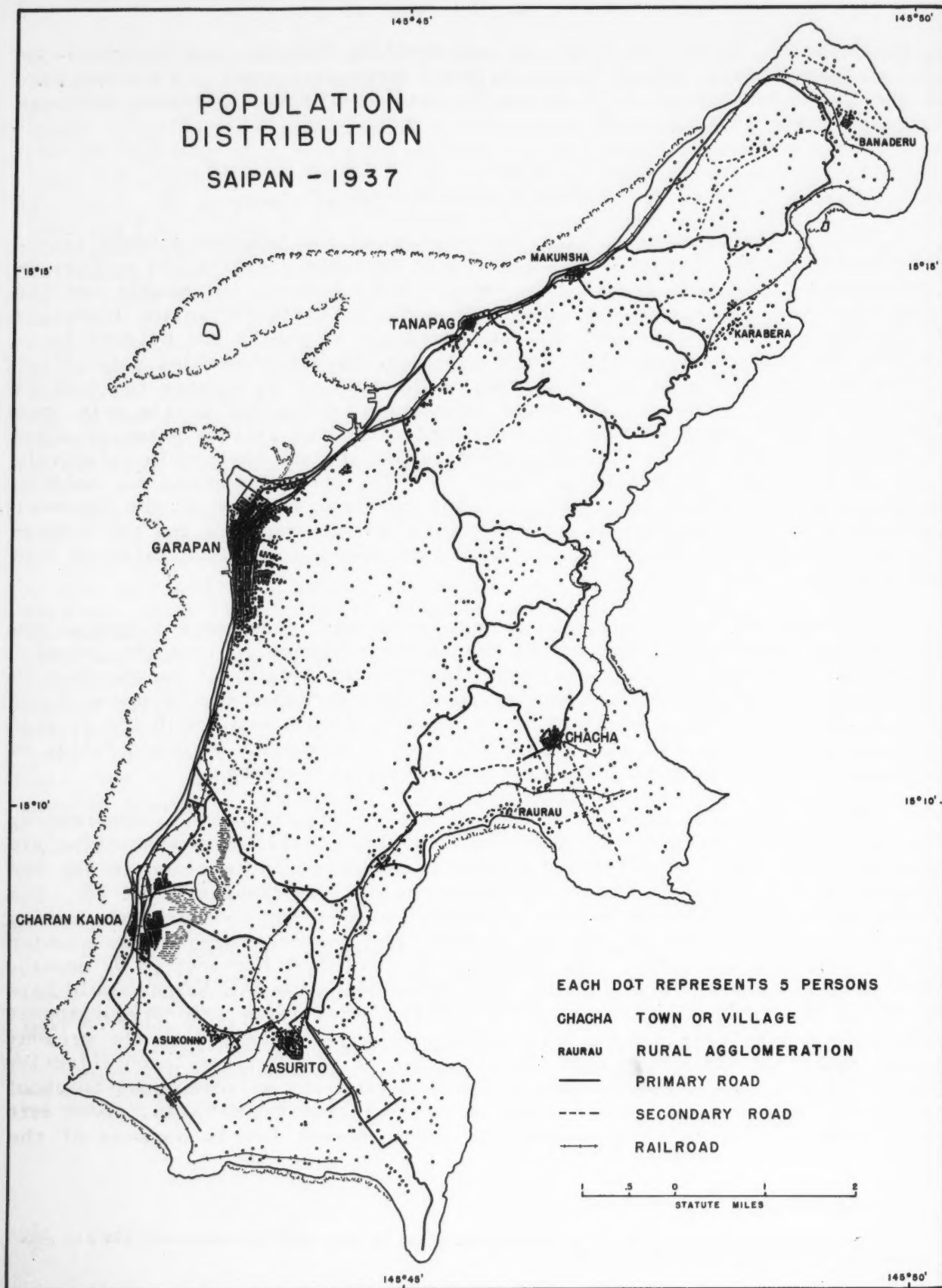


FIG. 36

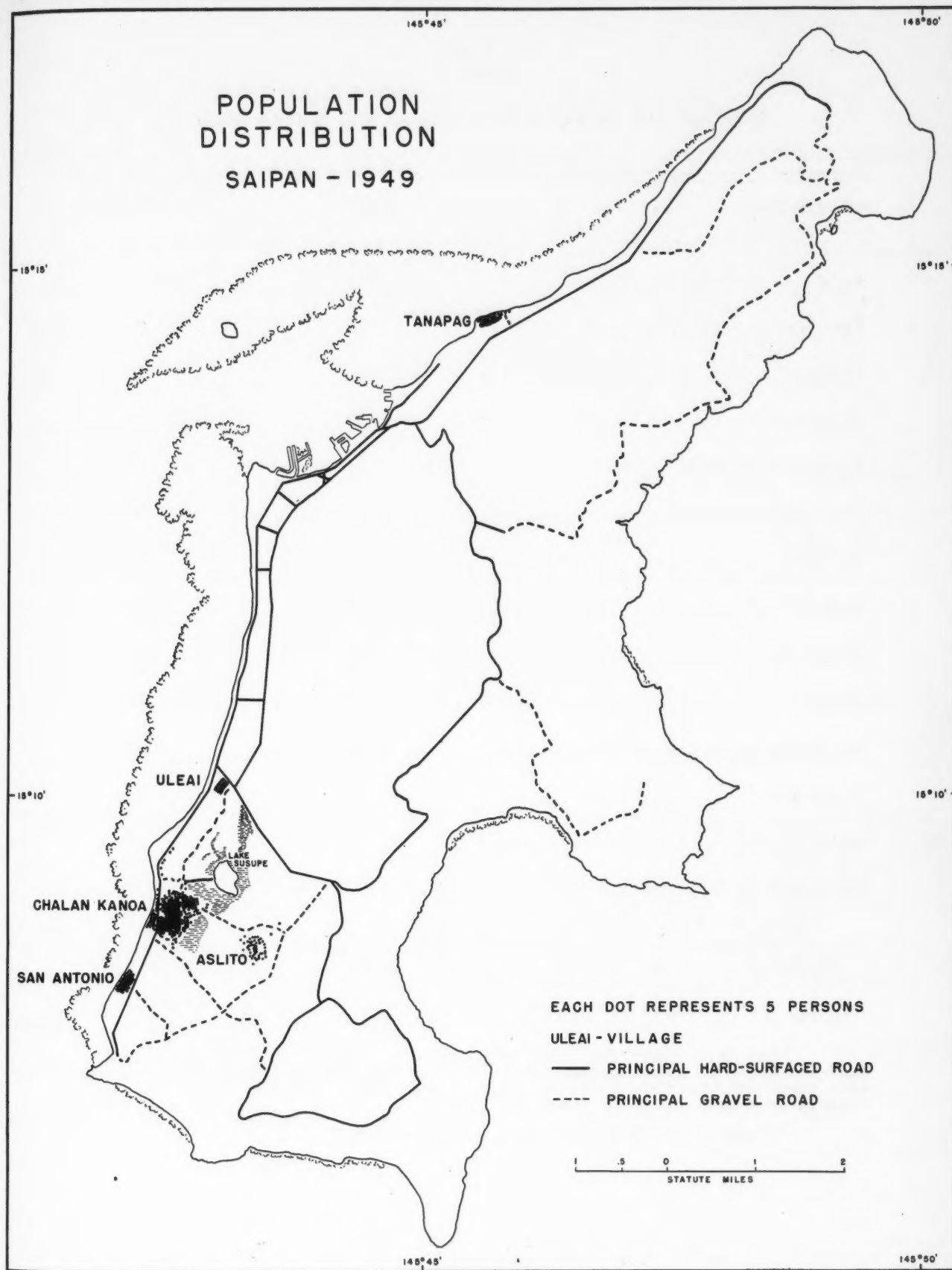


FIG. 37

TABLE 5
POSTWAR AND PREWAR POPULATION IN THE SAIPAN DISTRICT^a

<i>Island</i>	1949	1937
Rota.....	681	7,621
Aguijan.....	0	0
Tinian.....	364	14,917
Saipan.....	4,898	23,685
Farallon de Medinilla.....	0	0 ^b
Anatahan.....	0	40 ^b
Sarigan	0	0 ^b
Guguan.....	0	0 ^b
Alamagan.....	136	24 ^b
Pagan.....	0	220 ^b
Agrihan.....	146	88 ^b
Asuncion.....	0	0 ^b
Maug.....	0	0 ^b
Farallon de Pajaros.....	0	0 ^b
Total.....	6,225	46,708

^aSources: data for 1935 and 1937 are from U. S. Navy Department, *Mandated Marianas Islands*, pp. 34-35; figures for 1949 are as of Dec. 31, and were compiled from data in U. S. Navy, Civil Administration Unit, Saipan, 'Quarterly Report, Oct. 1 - Dec. 31, 1949.'

^bFigures for 1935; 1937 data not available.

<i>Island</i>	
Rota.....	
Tinian.....	
Saipan.....	
Alamagan.....	
Agrihan.....	
Total Saipan	
POSTWAR	
<i>Island</i>	<i>Pop Squ Are</i>
	1937.
Rota	50
Tinian	13
Saipan	292

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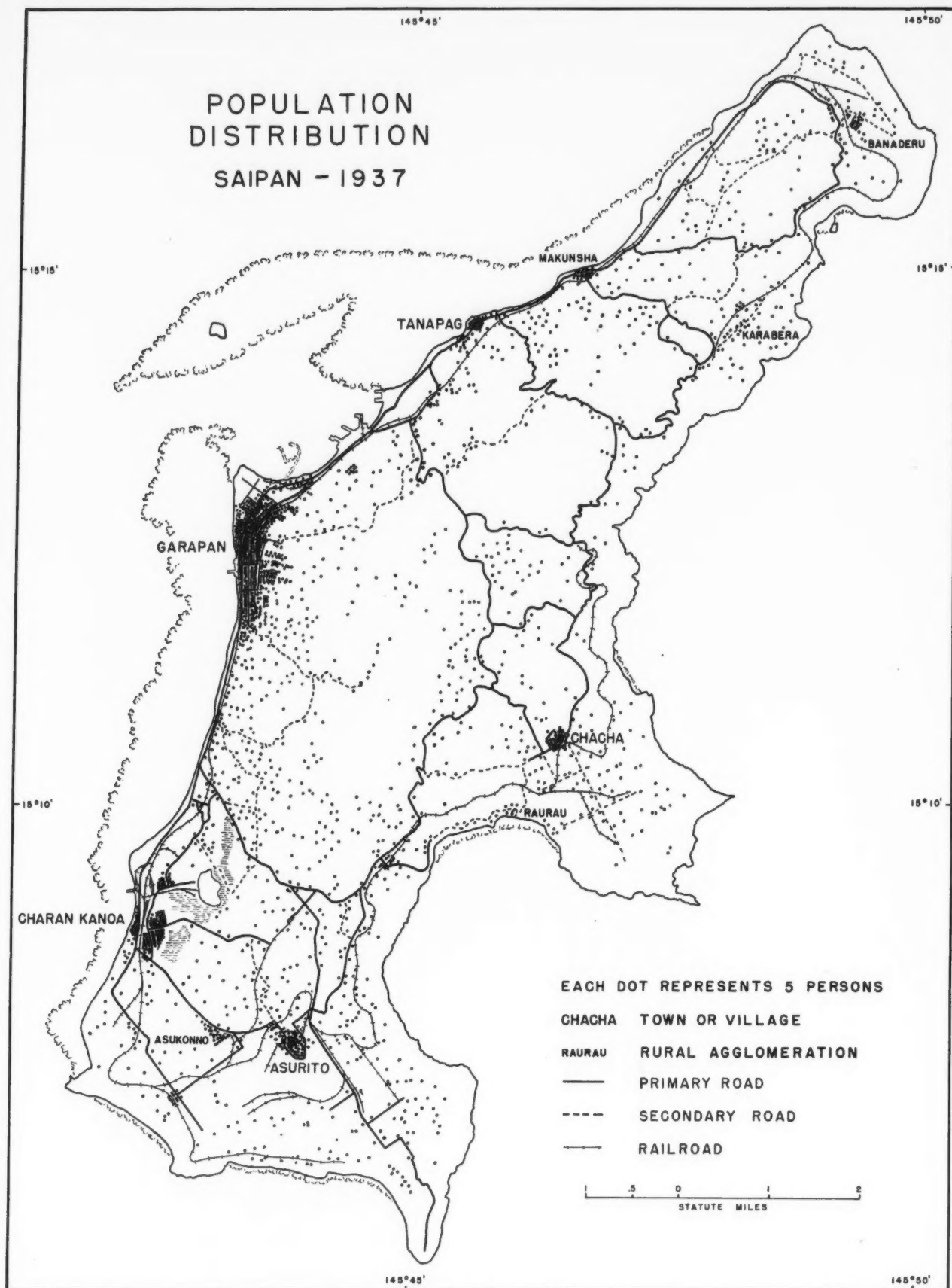


FIG. 36

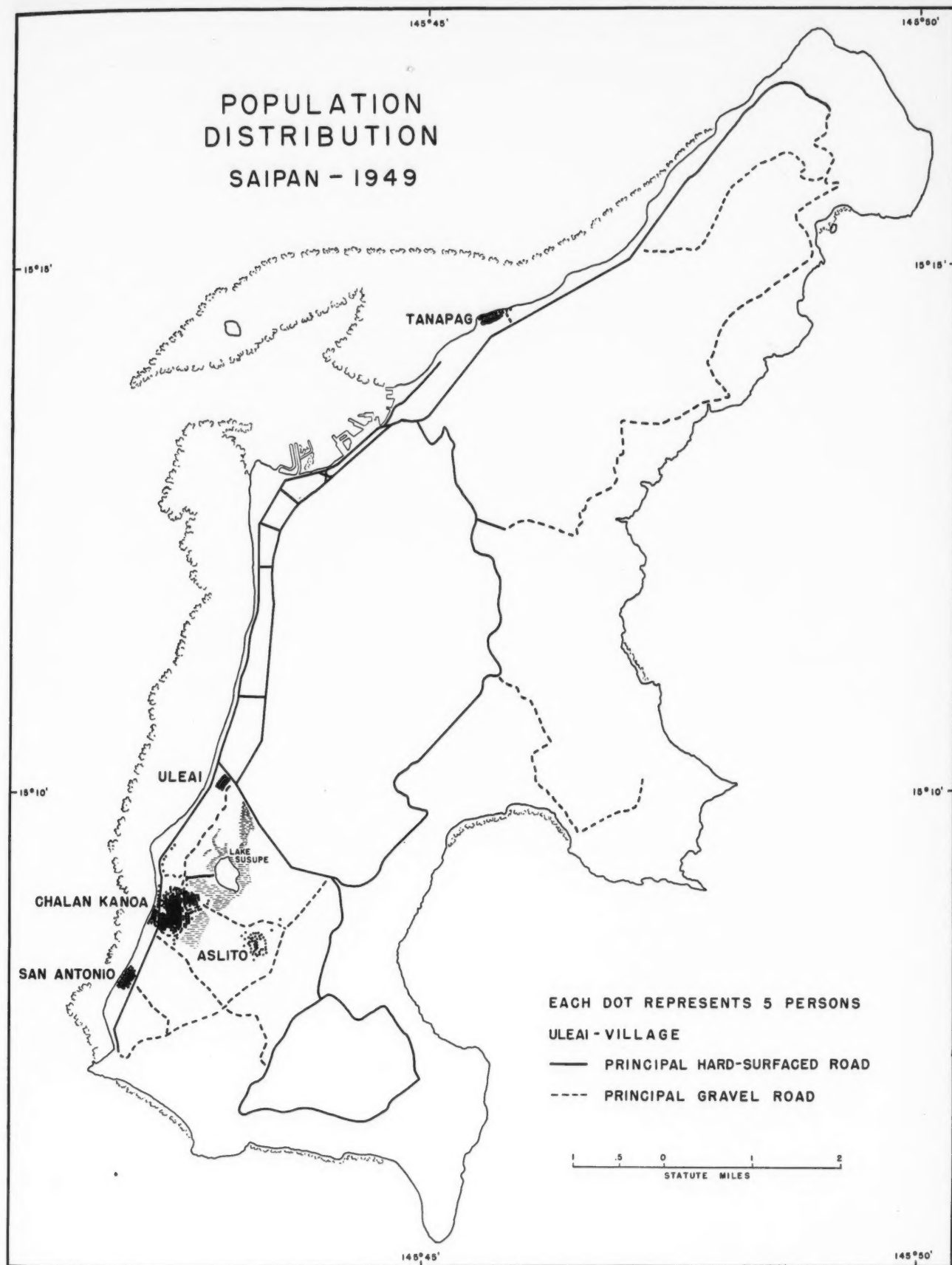


FIG. 37

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^aSources: data for 1935 and 1937 are from U. S. Navy Department, *Mandated Marianas Islands*, pp. 34-35; figures for 1949 are as of Dec. 31, and were compiled from data in U. S. Navy, Civil Administration Unit, Saipan, 'Quarterly Report, Oct. 1 - Dec. 31, 1949.'

^bFigures for 1935; 1937 data not available.

TABLE 6
POSTWAR AND PREWAR DENSITY OF POPULATION

<i>Island</i>	<i>1949 Density per Square Mile</i>	<i>1937 Density per Square Mile</i>
Rota.....	20.2	231.6
Tinian.....	9.0	379.6
Saipan.....	103.8	508.4
Alamagan.....	31.2	5.4
Agrihan.....	8.0	4.8
Total Saipan District	33.4	303.2

TABLE 7
POSTWAR AND PREWAR DENSITY: POPULATION TO ARABLE LAND RATIO

<i>Island</i>	<i>Population per Square Mile of Arable Land</i>		<i>Effective Population per Square Mile of Arable Land</i>	<i>Per Capita Acreage of Arable Land</i>		<i>Per Capita Acreage of Arable Land per Effective Worker</i>
	1949	1937	1949	1949	1937	1949
Rota	50.5	565.3	13.4	12.5	1.1	47.6
Tinian	13.2	463.1	3.5	48.3	1.4	181.4
Saipan	292.2	820.4	45.9	3.1	0.8	13.9

differences between the Japanese and the native agricultural methods and amount of labor applied per unit of area. The problem of restoring the former standard of living with present population numbers is not one that lends itself to quick solution, especially when the problem is complicated still further by subsistence-farming methods, lack of commercial crops, distance to markets, and the loss of markets during the war.

The ratios listed in Table 7 for 1949 are based on the total arable area of each of the three islands for native use, and are at present inapplicable because of the extent of American military holdings. On a basis of the former Japanese agricultural pattern, approximately 62 per cent of Saipan, 82 per cent of Tinian, and 41 per cent of Rota were arable. Airfields, which would be unfeasible to return to cultivation, occupy about 10 per cent of the former arable area of Saipan, 12 per cent of the arable area of Tinian, and one-half of one per cent of the arable area of Rota. With deductions for airfields, the present arable area of Saipan is about 15,500 acres, that of Tinian about 17,600 acres, and of Rota, 8,627 acres. Not all of this is at present available for native use. On Saipan, before the end of the war, American military installations occupied about 40 per cent of the island's area. As of August 31, 1948, some 2,300 acres, mostly arable land, or approximately 10 per cent of the island's area was still in active use; this area included about 1,500 acres from which the natives had been displaced as a result of wartime construction. On Tinian, about 50 per cent of the total area was being utilized by military units by the end of the war. No troops remain on the island, but it has been necessary for the military to retain about 15 per cent of the total area because of airfields and needed harbor and storage facilities. No natives, however, were displaced by American activities on Tinian, as all the land was owned by the Japanese government. Since Rota was occupied after the close of the war, military building was limited. Most of the construction has now been removed, and that which remains is on former Japanese government property. How many of the military areas will be retained and how many released is an unsettled question, dependent upon world conditions and military decisions. This imposes a difficult problem in planning, since the total area which will be open to native use is not known. Work has been initiated under a directive from the Deputy High Commissioner to determine the ownership and extent of lands needed by the Army, Navy, and Air Corp. Only after the completion of this survey can the relationship between the people and the land be accurately determined for use in planning.

Land Tenure and Associated Problems

Settlement of the problem of land ownership is of primary importance in the reestablishment of a sound economy in the Northern Marianas. The present confusion of titles is reflected in the economic sphere, retarding the development of the area. Civil Administration, confronted with tremendous difficulties in clearing the situation, has been handicapped by lack of staff and funds. A well-trained, adequately financed commission, supported by special appropriation, is needed to make the necessary cadastral surveys and solve the many legal problems involved, if a solution is to be reached in a reasonable length of time. Settlement is critical; successful agriculture can follow only if the farmer is secure upon his land.

Factors in the Present Land Problem

Many elements contribute to the present disorder, making solution difficult and time-consuming. Almost all land records were destroyed during the American assault, property markers were obliterated, and normal lines of inheritance were broken. Extensive areas were occupied by the military, native families were displaced from rural and urban holdings (Fig. 38). Some of these areas have been rendered useless by quarrying, bull-dozing, the seepage of oil from storage tanks, and the construction of airfields. Abandoned buildings, and the waste of war are scattered over the landscape (Figs. 31 and 39). In no cases have the islanders been paid for their land by either rental or purchase. Property exchanges have been made, but titles have not yet been cleared. Needed decisions as to the release or retention of military areas cannot be made locally but are dependent upon the War and Navy Departments in Washington. Also, determination of the final status of property held by Japanese nationals must await the signing of a peace treaty. The problem of the land has focused native attention on property rights and has resulted in a review of family holdings. Past losses, however legal, are recalled and discussed. Many of the claims are deeply rooted, dating back to the Spanish period, and involve disputes with the government, with family members, and with neighbors.

There exists, however, one advantage: the natives of the Marianas have already made the transition from indigenous to modern concepts of property, except for a few minor practices within the kinship group. As a result of foreign administration, the islanders are thoroughly familiar with the use of the line as a boundary between properties, the idea of legal, possessory private right, and the distinction between government and private land.

Under alien rule the natives have seen their lands become more and more circumscribed. Foreign jurisdictions, requiring deeds, titles, and leases and possessing power to alienate used or unused land, have left a strong imprint on native thinking. This has been accentuated by changes of political administration requiring reexamination of ownership and new surveys of holdings. The majority of the islanders do not understand the present complexities; attitudes range from the belief that the Americans own all the land by right of conquest to full understanding of the situation by a few individuals. Lack of clear titles and the necessary shifting of some farmers after they had cleared and brought land into cultivation has created a feeling of insecurity which retards development of the land, their basic resource. Planting of trees and the construction of improvements are delayed. Thoughts of income are turned away from rather than to the land, upon which the economic rehabilitation of the area must rest.

Full investigation of claims before the return of the natives to the land was an impossibility because of the imperative need of placing the economy on at least a subsistence basis. People were returned to their alleged property if possible, but if not, to some land so that production might be resumed. Every effort was made to locate displaced persons on property formerly held by the Japanese Government or one of its agencies. At the time, it was thought that the South Seas Development Company had been under the direct control of the Japanese Government, and that their properties could be used for resettlement along with the holdings of the Imperial Government. This was later proven incorrect by a decision rendered in 1947.

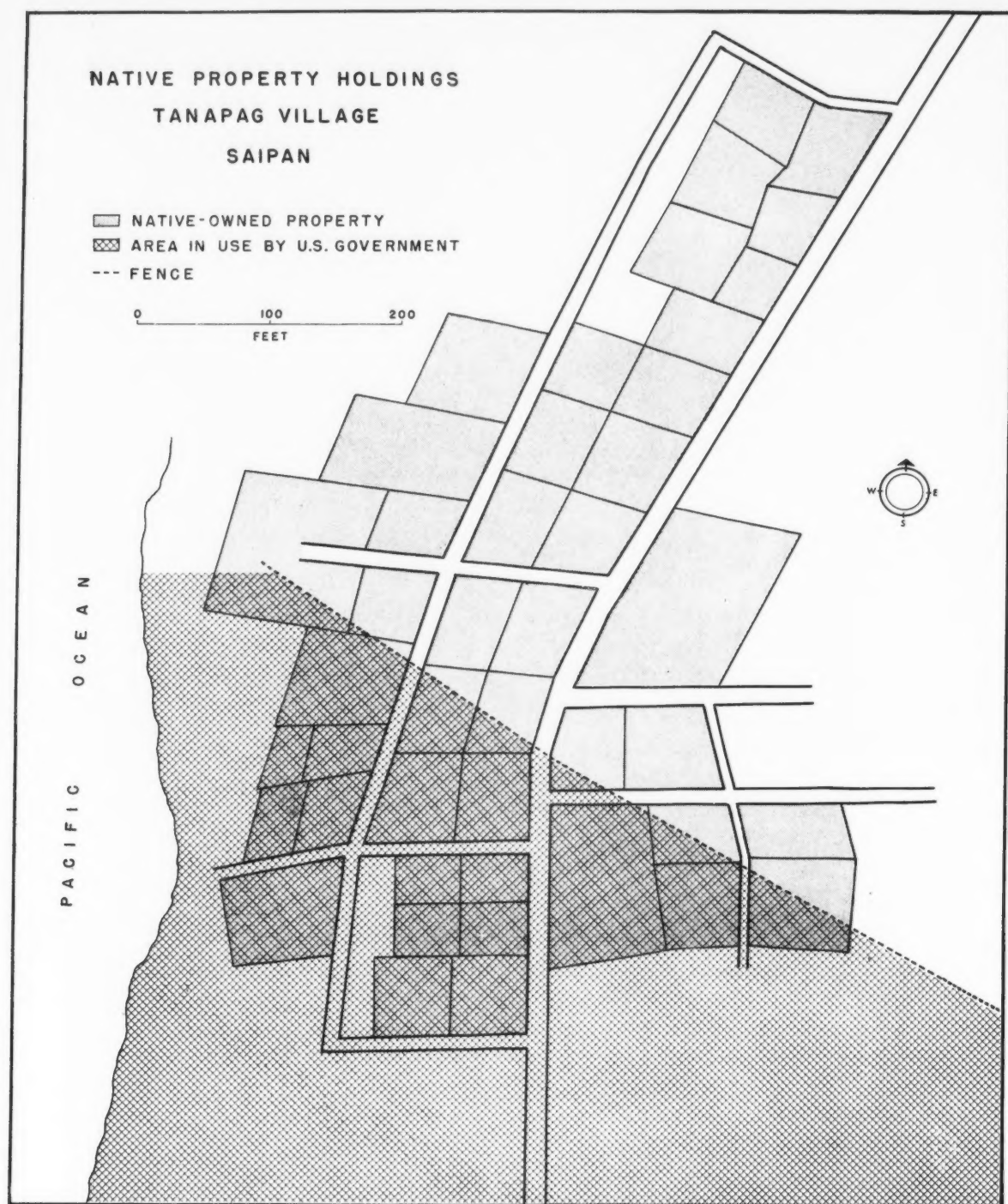


FIG. 38



FIG. 39. Saipan: Abandoned military structures. Some of these occupy former native farms.

Meanwhile considerable resettlement had already taken place. Because of the lack of adequate maps and records, occupancy of former Japanese government land with exactness was impossible. In order to fully protect individuals and property rights, both native and foreign, it was necessary to grant conditional land-use certificates, whether the assignee claimed title or not. Possession was revokable on sixty-days' notice in case legitimate claims of ownership were made by claimants 'other than the Japanese Imperial Government,' or if the land was required by the United States or any of its agencies. Permits to use land carried notices that the certificates were not titles, that they were non-transferable, and that the assignee might build or make improvements. All the native-cultivated land on Saipan is now held under certificates granting temporary use until ownership can be determined. Tinian presents no problem because the entire island was held as Japanese government property, and as such was automatically transferred to the United States to be held in trust for the native community.

Land problems on Rota, while not complicated by extensive American military holdings, are equal in perplexity to those of Saipan. Shortly after the Japanese began intensive exploitation of the island, the native farmers in the well-watered volcanic lands along the southeastern coast were moved to poorer lands on the western coast.¹ Resettlement was in the area in which

¹According to the natives, this movement occurred between 1931 and 1934. The sugar company began operations on Rota in 1932.

the Japanese later established the native village of Tatacho. Exchange of land was on a basis of equivalent area, cash was paid for standing crops, and deeds were given for the newly assigned holdings. It is not clear whether the vacated properties were acquired by the Japanese government, the sugar company, or Japanese nationals. Many of the Rotanese have returned to their former farms, to which they now have no legal title, and most of them include both the old and new holdings in reporting on the extent of their property.

The removal of the farmers from their traditional lands on Rota was followed by their forced movement from Songsong village to Tatacho (Fig. 40). This movement was initiated in 1936 and completed in 1937. The Chamorros received deeds to assigned lots in Tatacho of the same size and shape as their former holdings in Songsong. After the war, the Rotanese rebuilt on the Songsong site. By mutual agreement, former property holdings were disregarded, and each family selected a site on the side of the village nearest to its farm. Numerous persons, however, still carry in mind the size of their former lots and protest that their holdings are now smaller. There remains, also, the question of who owns the former Japanese property on which the native homes are now located.

A Land Titles Commission was organized as soon as feasible after American occupation. Such Japanese maps as were discovered in the ruins were redrawn and pressed into use. Each property holding on Saipan was found to have been numbered on the maps, but the accompanying records were never recovered. In some cases it has been possible to trace ownership through lease records of the sugar company, but these too are incomplete. Before the repatriation of the Japanese, 776 hearings were conducted among the natives, Japanese, and Koreans on Saipan to determine lot numbers, extent of property, lease status, and other related information. Some 811 Saipanese were interviewed in 1947 and 1948 in connection with the ownership and title of lands required for Army, Navy, and Air Force installations. These 1,587 hearings have supplied a body of data now held for future processing. Numerous inaccuracies between the two sets of data now require clarification, and all information must be substantiated for the final settlement of claims.

Claims submitted to the Land Titles Commission are determined by the following evidence, here listed in order of preference:

- (1) A deed or certificate of ownership issued during the Japanese period.
- (2) Copies of such deeds or certificates.
- (3) Evidence of title registration in South Seas Development Company lease records.
- (4) Testimony under oath of at least three of the adjoining property owners that the claimant is the rightful heir and that mutual boundaries are satisfactory.

The commission is aided by one of the oldest and best-informed men on Saipan, who affirms all testimony. Any person is free to contest a decision. Since nearly all cases fall under the fourth procedure, progress is slow: as of

STATION **GARAPAN**
SAIPAN, MARIANA ISLANDS

LATITUDE **15°12'15" N.** LONGITUDE **145°43'15" E.** ALTITUDE **10 FT.**

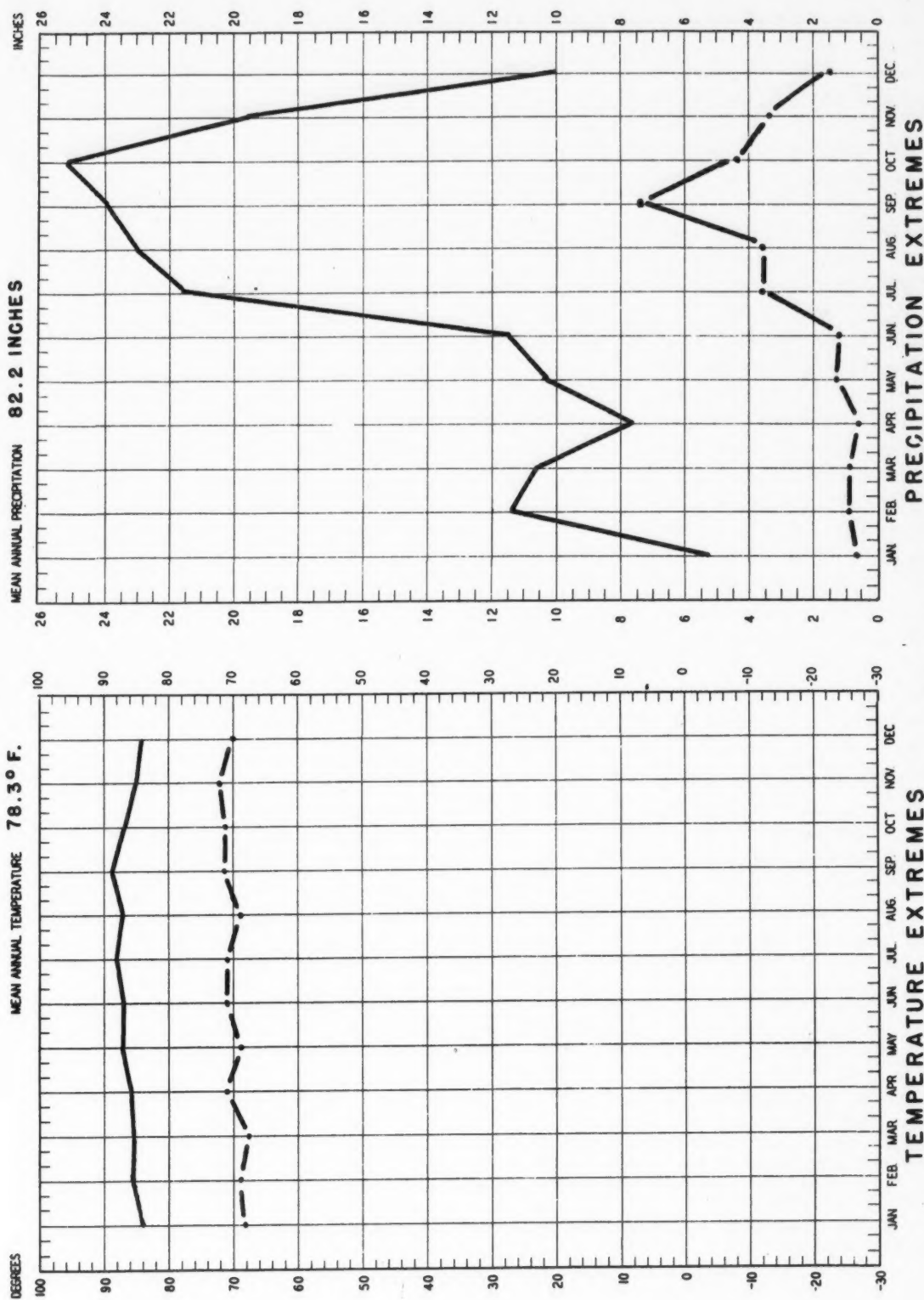


FIG. 40

December 31, 1948, only nineteen cases had been settled.¹ No further decisions have been announced, the work having been disrupted by hearings for the proposed military holdings. It is difficult to gauge the size of the task facing the commission. Japanese maps of property holdings show hundreds of plots on Saipan alone.

One problem certain to come before the Land Commission is that arising from reported abuses of native property rights by the Japanese. The picture, however, is not entirely clear. Numerous islanders reported that the Japanese took their land illegally, but questioning usually revealed that payment was made or other land was given in exchange. Claims that the Japanese forced transactions for military purposes without payment just before and during World War II seem to have the most valid foundation.² It appears that, although many transactions were legal in form, the natives complied under a feeling of pressure or in deference to the Japanese as the ruling group. Stories indicate that islanders holding unused or desirable land, especially that adjacent to sugar cane plantations, were visited by sugar company representatives, and sometimes government officials, who pressed the owner to rent. When a tenant once occupied a piece of property, it was almost impossible for a native owner to regain control, although the annual rent was not denied. Natives who did not wish to renew leases were appeased with the explanation that the renter could not move because of investment in plantings or buildings or inability to find other land. Stories were also told of transfers and leases which were made while the native was under the influence of alcohol. Some natives reported that payments were not made on long-term leases during the late years of the war, after curtailment of shipping by American submarine activity had drastically reduced the profits of the sugar company. In a few cases, it was discovered that some of the natives felt that their lands had been illegally used because they had not received complete payment on leases which extended beyond the date of American occupation.

Dispossession on Rota, involving an exchange of property, was forced in the sense that the natives felt that they were obliged to comply. Two families were reported to have resisted Japanese efforts and remained on their farms.³ Before the movement from Songsong, the Rotanese were brought together in public assembly and addressed by government officials, among them the

¹U. S. Navy, Civil Administration Unit, Saipan, 'Quarterly Report, Oct. 1 - Dec. 31, 1948.'

²It should be pointed out that many natives now regard the Americans in the same light, since rental or payment has not been made or other land given in clear title for private property occupied by military installations. While Civil Administration has done everything possible within the range of their staff and funds to clear this situation, they have been handicapped and delayed by factors beyond their control.

³The members of these two families were reported to have been severely used by the Japanese during the war.

Governor of the Marianas and the Governor of Saipan. The islanders reported that they were told they 'had to move,' and that the Chief of Police was placed in charge of their change of residence.

From the dating of native stories, it is apparent that pressure tactics on the part of the Japanese increased after 1930, as immigration swelled the population, and especially after 1935, when Japan withdrew from the League of Nations. This entire question of Japanese abuse of land rights is fraught with considerable emotion, and reports from the field are conflicting. How great a part coercion played in transactions, and to what extent this should influence the decisions of the Land Titles Commission can only be determined through legal processes.

Inasmuch as the present land problems arise not only from American occupancy but also from past patterns of tenure, it is necessary to review the land history of the pre-war regimes and the traditional background of the natives regarding land holdings, in order to note the influences which condition the present attitudes of claimants and the problems facing the land commission.

Japanese Land Policy

Motivated by a desire to utilize the mandated area for colonization, the Japanese followed a very direct and thorough policy in regard to land ownership. Special funds were allotted by the Imperial Diet to increase the staff of the Land Bureau and to facilitate the work of determining boundaries and settling disputed claims. Many of the problems encountered were similar to those now confronting American administration: lost documents, incomplete records, obscure boundaries, and a need for complete cadastral survey.

Following approval of the Japanese mandate by the League of Nations in 1920, the South Seas Bureau granted provisional recognition of all existing land titles and possessory use of occupied land for which claimants held no documents. In 1923, a cadastral survey was inaugurated throughout Japanese Micronesia to set apart land available for Japanese settlement. This was completed in 1932 and was followed by investigation and cadastral survey of land held in private ownership.¹ While this survey may not have been completed for all of the Japanese mandate, the Marianas were among the first islands investigated and Saipan, Tinian, and Rota were entirely covered. According to the natives the survey was conducted with fairness. It is not known whether land titles were legally registered at this time or not. In the reports to the League of Nations, the statement 'the time has not yet arrived....for making registration of the land' appears for the last time in 1932.² This statement implies that registration of titles took place on each

¹This survey was based upon South Sea Bureau Ordinance No. 12, promulgated on October 23, 1925, amended in August, 1929. Japanese Government, South Seas Bureau, *Laws and Regulations appended to the Annual Report to the League of Nations, 1930* (Tokyo: 1931), p. 223.

²Japanese Government, South Seas Bureau, *Annual Report to the League of Nations, 1932* (Tokyo: 1933), p. 112.

island after the completion of the second survey. However, since Saipan was resurveyed for a third time in 1939, it can be deducted that no final titles were granted until that date, and that elsewhere in the Northern Marianas titles were never fully cleared. On the third survey, the working party operated from a starting point at a cement pillar at the east edge of Garapan pier,¹ redetermined the boundaries of all plots, gave each plot a new number, and marked all corners with distinctive pillars to indicate whether the property was held by the Japanese government or a private individual or was leased by the South Seas Development Company. Following completion of this work, each property owner received a title numbered according to the new survey.

Land holdings in Japanese Micronesia were officially classified as either government or private property. Government holdings included all former German areas transferred to the state domain after Japanese occupation and such lands as were reclaimed or purchased. These lands were divided into four categories: (1) domain for public use, (2) domain for government use, (3) domain for forests, and (4) domain for miscellaneous purposes. Land under the fourth classification could be transferred to private ownership, but was commonly leased to Japanese companies and civilians as long as it was not needed by the government. Private lands were indicated as native or non-native owned, and each type was regulated on a different basis. As a result of the second cadastral survey in the Marianas, the administration reported the distribution of property in 1935 as shown in Table 8, with Tinian 100 per cent under government ownership; Saipan, 78 per cent; and Rota, 88 per cent.

In view of the problem now facing American administration, it is interesting to review the time spent by the Japanese in investigation and cadastral survey of land holdings. Throughout Japanese Mandated Micronesia, the completion of the first survey and the possible completion of the second required at least twenty years from the date of inauguration in 1923. The work was carried forward with funds appropriated to speed the task by providing extra clerical and surveying staff. No records are available as to how much time was spent in the Marianas, but, as is indicated above, the third survey on Saipan in 1939 probably cleared all land titles on that particular island. On this basis, sixteen years were spent in the settlement of the land problem on Saipan, or, from the date of Japanese military occupation in 1914, twenty-five years passed before titles were fully cleared.

When the Japanese assumed control in 1914, the native holdings on Saipan were concentrated on the western lowland, with scattered cultivated areas on the southern plateau and the foothills of the mountain core and a few as distant as the east coast. On Tinian, the native farm plots were adjacent to the harbor and extended inland along Marpo Valley in relation to easy accessibility from the small village of Taga. When the inhabitants, who numbered about 95 persons, were moved to Saipan, Tinian was left entirely open to

¹The pillar, originally about five feet high, was damaged by shell fire, but a stump about three feet high remains.

TABLE 8

LAND OWNERSHIP, SAIPAN, TINIAN, AND ROTA, 1935^a

	Saipan (Acres)	Tinian (Acres)	Rota (Acres)
Government Ownership.....	22,966	25,145	16,627
Native Ownership.....	6,213	0	2,432
Non-native Ownership.....	141	0	65
Total...	29,320	25,145	21,124

^aU. S. Navy Department, *Mandated Marianas Islands*, p. 162.

Japanese colonization. On Rota, the areas in native possession extended northward and eastward along the coast from the village on the isthmus, with the densest grouping in the volcanic region on the southeast. All native land boundaries were laid out in metes and bounds, and marked by such natural features as stones, trees, and cliffs. The incoming Japanese divided the land appropriated as government property¹ into rectangular six-cho plots (14.7 acres),² so that except on Tinian, where the natives lost all holdings, the land shows a combination of the two patterns. During the early period of Japanese rule, land was abundant and few problems arose along the lines where native and Japanese property adjoined. Up until about 1930, Japanese colonization and the sugar plantings of the South Seas Development Company appear to have been largely contained within the area of government-owned land. On Saipan, at about this time, the sugar plantings occupied clearings in the forest area which was taken over by the government when the Japanese acquired the islands (Fig. 41). Later, as the sugar industry expanded and immigration increased, the Japanese need for more land for sugar cane and food production gave rise to the feeling that the natives held more property than was required

¹The right of the Japanese Government to appropriate German government holdings for Japanese colonization, thus depriving the natives of land for expansion, was questioned by the League of Nations. The Japanese explained that these lands were legally part of the State Domain by priority right in accordance with Clause 2 of Article CCLVII of the Treaty of Versailles. Japanese Government, South Seas Bureau, *Annual Report to the League of Nations*, 1925, p. 98.

²A chobu (cho) measures 60 ken by 50 ken, or 119.4 yards by 99.5 yards.

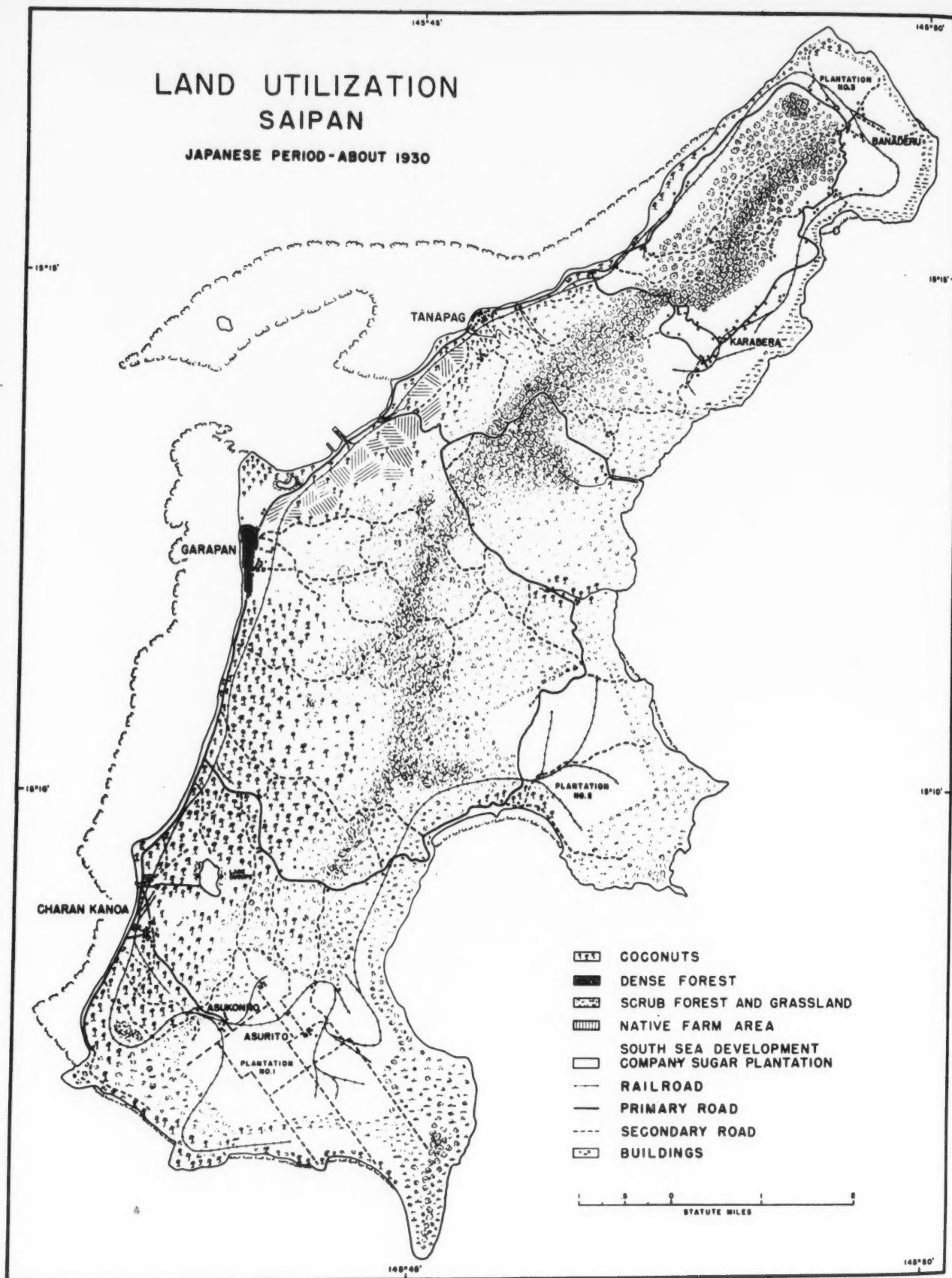


FIG. 41

for their subsistence ~~and~~.¹ This attitude was expressed in the forced movement of the natives from their original holdings, the pressure brought to bear upon the islanders to lease their land, and in the legislation enacted governing native-owned lands.

Upon acquisition of the islands, the Japanese reenacted the general policies followed by the Germans to protect the natives against loss of their land. No restrictions were placed on sale and transfer among the natives themselves, but no alien other than the government authorities was permitted to conclude any contract for the sale, purchase, alienation, or mortgage of land owned by islanders; nor were leases for more than a year considered effective unless approved and registered by Civil Administration.² In 1931, this was amended to permit aliens to purchase or mortgage native land with the sanction of the Director of the South Seas Bureau.³ The Japanese explained this change of policy as based on the 'recent advancement of the natives in economic conditions' so that 'it is considered disadvantageous for them to make the disposal of their land an object of absolute prohibition.'⁴ Detailed information of such transactions and their geographical distribution by island areas throughout Micronesia is not available. Nor is data available on the extent of these transactions following Japan's withdrawal from the League. But it is significant to note that, between 1931 and 1935, some 283.47 hectares (700.45 acres) were involved in transactions between Japanese and natives in the Japanese mandate, with an increase of 320 per cent in 1935 over 1934.⁵

¹The natives must be allowed to retain the minimum amount of land necessary for their livelihood; the rest of their lands must be developed and rendered to full utilization by our own people Per capita native land ownership in the Japanese mandated area averages approximately one cho. (2.45 acres).... Such excessive ownership is absolutely not necessary.... I wish to emphasize that the per capita ownership of four tan (0.98 acres) is sufficient for the native. Surplus land must be purchased by the government and distributed among the Japanese colonists.' (Tetsusaburo Uehara 'Land Problems in the South Sea Islands,' Translation, Chapter III *A Study of the South Sea Islands Observed as a Colony*, Tokyo: South Sea Culture Association, 1940) (Typewritten copy, Pacific Science Board, Honolulu)

²Civil Administration Order No. 3, promulgated on January 20, 1916. Japanese Government, *Laws and Regulations Appended to the Annual Report*, 1926, p. 284.

³South Seas Bureau Ordinance No. 12, promulgated September 1, 1931. Japanese Government, *Report to the League of Nations*, 1931, p. 204.

⁴Japanese Government, *Report to the League of Nations*, 1934, p. 71.

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As government approval was required for long-term leases contracted with the natives, administrative officials were in a key position to aid in the pressure techniques already mentioned. Roughly 85 to 90 per cent of the natives on Saipan and Rota rented at least a part of their land for periods varying from five to twenty years, generally to the sugar company but sometimes to Japanese nationals.¹ Payments were made at periodic intervals, but in some cases natives requested and obtained rent far in advance of the date due, a situation which sometimes led to considerable confusion and ill feeling. The sugar company leased the rented land to immigrant farmers who built homes and cultivated cane. Japanese citizens who rented native land usually did so for commercial truck farming or to acquire an area for domestic production. In the first case, homes were usually constructed by the tenant on the land. The islanders also sometimes rented papaya trees to persons engaged in the manufacture of papain. No instance was encountered of the rental of coconut groves; this may have occurred, but, since the palms on Saipan and Rota were few and of low productivity because of the coconut beetle, rentals would be exceptional.

German Land Policy

Preceding the Japanese, the Germans recognized native land titles on a basis of use. Property that was claimed but unutilized for agriculture or grazing was confiscated and added to government possession. Only the government and the natives were permitted to hold land. In 1904, all alien-owned holdings, mainly Japanese coconut plantations, were taken over by the administration or by natives. Any native was permitted to acquire additional land by clearing and bringing an area into cultivation. Thus land was provided for Carolinian immigrants or for any young native resident who wished to establish a homestead. Government land was also open to German colonists on ninety-nine year lease on payment of four marks per acre for the first twenty-five years and agreement to rental adjustment not to exceed twice the original charge for each of the following twenty-five years. Colonization plans were not a success, and the greater part of the island area was in government possession at the end of the German period.

Native claims that the Germans took land illegally refer to the government practice of assuming control of unused areas. On Saipan, some of the islanders lost possession of land on Kagman Peninsula. Some of these areas were regarded as grazing lands by their owners; others may have been used on a family basis for collecting wild foods, for timber supply, or as approaches to fishing areas, hence may have come to be regarded as being held in ownership. The Germans regarded their appropriation of unused land as taking possession of Spanish Crown areas, which in the Northern Marianas had never been clearly defined. Some of the land lost to the natives under the Germans has been reoccupied on a basis of former family ownership.

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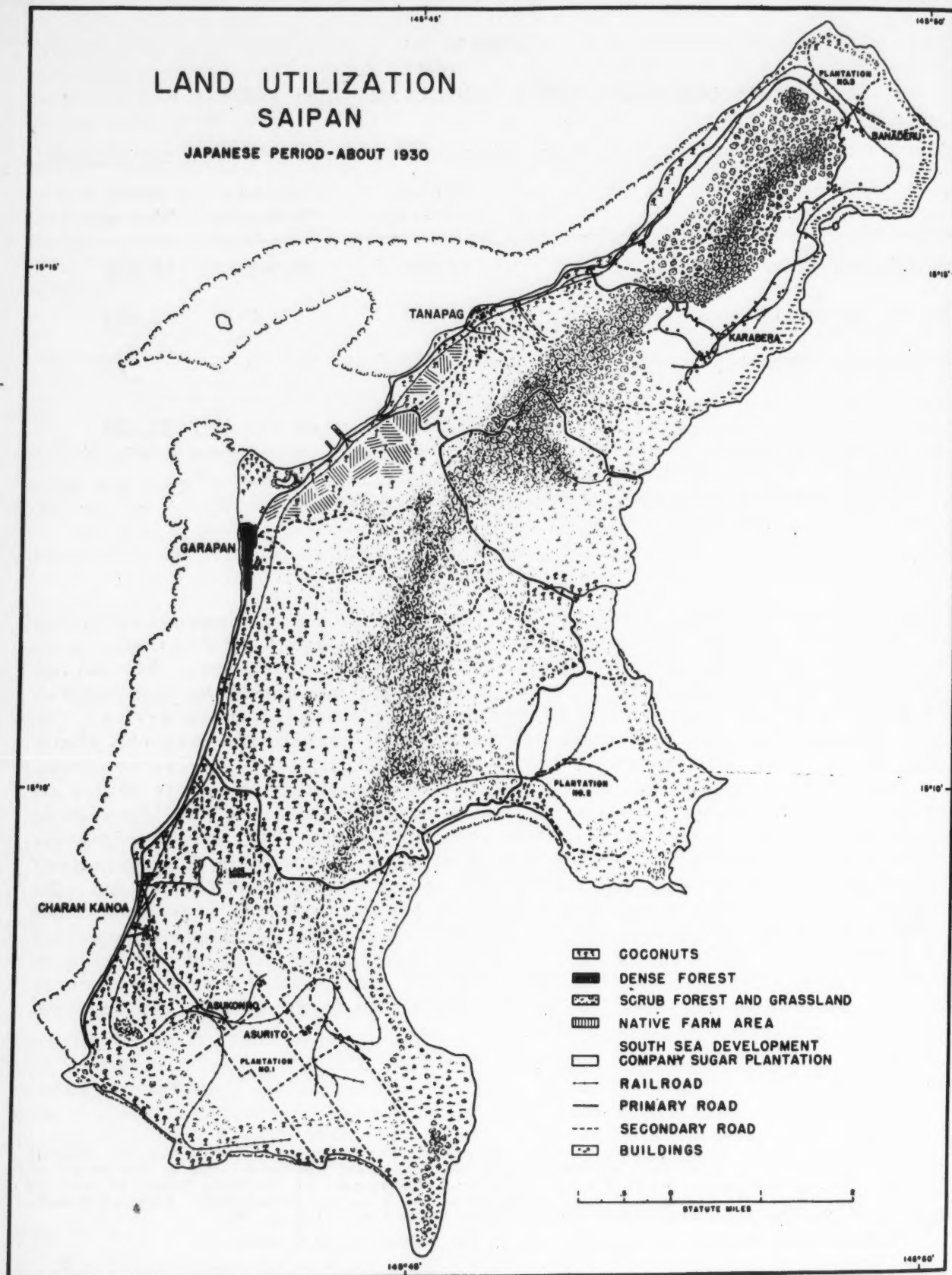


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completed. Some of the natives acquired certificates of possession, but the Japanese reported that no land owned by islanders was entered in the official register.¹ It is apparent, however, that the Germans planned to grant deeds recognizing the right of continued and inheritable ownership pending the completion of surveys, when the right of ownership could be fully established. The total task, however, with its carry-over of problems from the Spanish period, was too great for completion during German administration with the limited staff and expenditure devoted to the task.

Spanish Land Policy

In accordance with the political philosophy of the period, the Spanish assumed sovereignty over the Marianas on a basis of discovery and occupance. Since the islands were never settled by Spanish colonists, the area escaped the tensions which arise over property right when two unlike tenure systems come in conflict. The aboriginal tenure forms, however, were replaced by Western practices, and possessory title was granted to land on a basis of occupance and use. This procedure was not regarded as legal by the Spanish Government, and in 1894, a royal decree was issued nullifying all possessory titles which were not perfected by April 17, 1895. Regardless of the royal order, no titles were legally registered on Guam by the given date, in fact, the court continued to issue possessory titles. What procedure may have been followed on Saipan, Tinian, and Rota is unknown, but it is probable that the titles there were never legalized in terms of Spanish law.

Aboriginal Land Practice

The forms of aboriginal tenure which preceded Spanish occupance are imperfectly known, being a part of that large body of immaterial culture which is often unobserved and frequently unsuspected. Infrequent references by early voyagers and missionaries point to a complex system with clearly defined practices as to hunting, fishing, collecting, and cultivation, supported by an elaborate structure of etiquette and taboo. The islands were divided into districts, each controlled by a chief, who probably held proprietary but not possessory rights over the land. Within each district only the local members of the clan had rights of utilization, but to what extent land was held, controlled, or owned by individuals is unknown. It is probable that the land as a whole was regarded as belonging to the clan and was inherited through family lines on a basis of occupance. Trespass upon a district by neighboring peoples led to strife. Such infringement also involved a supernatural hazard, since each district was protected by its *taotaomona*,

¹Japanese Government, South Seas Bureau, *Report to the League of Nations*, 1924, p. 54.

the spirits of the 'people of beforetime.'¹ The indigenous system has now been completely replaced by western forms except for a continuation of the native attitude towards the land and a few practices operative within the kinship group.

Since the soil has been the main source of wealth since prehistoric occupancy, land and its possession are intimately related to the social attitudes of the people. The feeling towards the land is one common to many peasant folk; in a sense the land is a part of themselves and, by centuries of cultivation, they have become a part of it. Although land is held under western forms, in one person's name, it is commonly regarded as belonging to the entire family.² The family works the land as a communal unit and the produce is utilized by the group.

Inheritance

The system of inheritance among the Chamorros rests on custom rather than written code. Wills are infrequently made; generally the disposal of property is indicated before the decease of the owner, who retains legal title until his death. Inheritance is discussed in family gatherings, and the heirs may already be in practical possession at the time of the death of the owner. It is customary for the youngest son to receive the largest share, since he usually remains at home to care for his parents and frequently contributes his efforts towards establishing his brothers in their homes. Married daughters commonly receive less than sons, sometimes only cash or personal property. Unmarried daughters whose likelihood of becoming married is slight because of age or disability usually receive land in equal share with the sons, unless the amount to be divided is small, in which case, support of the sister falls upon her brothers. Lands of husband and wife, while worked jointly by the family, are rarely combined in title. Each disposes of his property individually to the children. Since Chamorro families are usually large, there is seldom a lack of heirs. Should there be no heir, the owner customarily designates that his property pass to a godchild or relative or some friend who has given assistance as the owner grew older. Chamorro informants stated that an offspring may be denied his inheritance if

¹Belief in *taotaomona*, or, as translated, 'the people of beforetime,' is a survival from aboriginal beliefs. There is considerable confusion over the definition of the term; some natives regard the *taotaomona* as spirits of former chiefs, others as those of Chamorros who have been killed. These beings are ugly, tall, and strong and are believed to guard their districts against trespass and to cause people harm. According to native stories, it is possible to ally oneself with a *taotaomona* and thereby gain supernatural strength to carry out daily work in a shorter time. In addition to the *taotaomona*, the natives also express belief in several other types of supernatural beings. During the centuries of contacts with foreign cultures, these beliefs have been modified so as to appear consistent with newer religious faiths.

²Thus natives commonly answer 'this is my land' in questions as to ownership, when actually it is legally held by father or mother or perhaps by a brother or sister.

he does not contribute properly to the family group or give aid to his parents in old age. No cases were known of property being willed to the church or a charitable institution. There is apparently no procedure within native custom by which a dissatisfied heir can effect a change in the distribution of property after the death of the owner.

The Carolinians, in contrast to the Chamorros, inherit property in matrilineal line. Land passes from mother to oldest daughter, or, failing an immediate heir, to the mother's oldest sister or her oldest daughter. Inheritance carries with it the responsibility for the care of any children who may have been deprived of their female parent. The Carolinian male works family lands by right of birth until his marriage, after which he cultivates areas held by his wife or his mother-in-law. Only a very few Carolinian men hold title to land; the land which they received from the German Government at the time of their migration to the Marianas has almost completely passed to female ownership. With the relatively loose marriage ties among the Carolinians, the system provides both security for children and continuity of family possessions of lands.

Because of the family communal attitude towards the land, its division by inheritance does not necessarily affect the total use of the land. The tendency for individual holdings to become smaller and smaller is offset by uniting the plots and working it by family groups. Persons holding land by title grant use to relatives without definite terms of lease or payment quite outside the strict legal code of property right. This is explained with the comment that 'he is my brother,' or 'he's my brother-in-law,' and no specified amount of agricultural produce is expected in return. A relative may also build a house on another's land, retaining all rights of practical ownership as long as he wishes, although title to land legally includes buildings. Thus, side by side with the strict legal forms which are fully recognized in transactions with aliens, there exists an accepted disregard for strict property right within the extended family. Eventually, however, if no lands are open for homesteading, as occurred under the Japanese, both the Chamorro and Carolinian systems of inheritance lead to overpopulation of the native lands.

Summary

There is hardly an aspect of land and its tenure in the Northern Marianas that is not beset with some difficulty of solution. The problem is not unique, in that it is repeated many times over in colonial areas around the world where foreign administration has introduced new land systems alongside the old. The significance of the land to native populations has usually been underestimated, as has also the importance of solution for the general welfare of the people. A review of land problems in colonial areas indicates that few governments have made much progress beyond settling immediate controversies. The raising of funds for cadastral surveys, the making of many records, the investigation and settlement of disputes through interpreters, and the adjustment of legal codes to native custom all delay and hamper progress. The work of the Japanese in the Pacific was outstanding for the rapidity with which they carried through the land survey, but they were not motivated by a primary regard for the native interests.

United States Civil Administration has proceeded on the policy that native rights to the land must be fully protected. In November, 1946, a

comprehensive policy was laid down on land title problems by the government of the Trust Territory providing for the establishment of land commissions to collect and sift information relating to prewar land claims.¹ These policies were expanded in December of 1946 by the Deputy High Commissioner, who advised all government units that 'military necessity no longer existed as a justification for official actions in regard to privately owned land,' and that 'except where it involved land physically occupied by American forces or their installations, all rightful owners were to be assisted in recovering possession of their lands from other persons.. To further implement this policy, all findings of the land titles investigation commissions are to be published in the community where the land lies, or in the community most concerned.'² A later directive, of December, 1947, again reiterated that 'the guiding principle of land policy is to safeguard native land rights and land ownership, and so far as possible, to provide each family with land sufficient for adequate subsistence.'³ The same directive stated:

It was deemed necessary to regard all lands which the German or Japanese governments took physical possession of, or developed, or used, as having acquired the status of public lands....to be administered for public benefit, [and that] in the future, the transfer of title of such lands to non-native individuals or persons will not be considered valid.... Decisions by former governments as to land ownership and rights, prior to the effective date of Japan's resignation from the League of Nations on March 27, 1935, [are to] be considered binding, [and those since that date are to be] considered valid unless the former owner or heirs establishes that the sale was not made of free will and that just compensation was not received. In such cases the title will be returned to the former owner upon his paying to the Trust Territory government the amount received by him.... When possible government activities shall be concentrated on government-owned land, and private property returned to the owners at the earliest possible date.... When it is necessary to retain privately owned land for government purposes, it is preferable from all points of view that the owner or owners, including those holding remainder or reversionary rights, be compensated by award of title to other land rather than by cash payment.... Civil administrators are authorized to initiate payments of rental at reasonable rates for lands occupied by civil government activities.... Leases of native-owned lands to non-natives will not be made without the approval of the High Commissioner. In preliminary negotiations for such leases it is to be borne in mind that long-term

¹U. S. Navy Department, *Handbook on the Trust Territory*, p. 169.

²*Ibid.*, pp. 169-170.

³U. S. Navy Department, *Information on the Trust Territory of the Pacific Islands Transmitted by the United States to the Secretary General of the United Nations Pursuant to Article 88 of the Charter*, OPNAV-P22-100 E, (Washington: 1948), p. 109.

leases, and particularly those extending beyond one generation, are not primarily in the interests of the natives. The long range plan includes cadastral survey of the land, registration of titles, and recording of all transfers.¹

It is evident that the problems involved in land settlement will extend over a period of years even if attacked with all expediency. Much preliminary work has been done by Naval Civil Administration, but to date funds granted to the Trust Territory government have been inadequate to meet the situation. Since the economic well-being of the native is dependent upon his security on the land, a special land and claims commission, staffed by legal advisors, surveyors, and clerical personnel similar to that created by an act of Congress for Guam, should be established for each administrative district to investigate, determine, and legalize all land holdings and codify the native concepts of land tenure for use as a guide in future decisions on titles.

Resettlement and Associated Problems

The displacement of native population resulting from the destruction of villages and farmsteads and the occupation of land by military installations confronted American administration with the problem of resettling the people in new homes. Since any community, however small, represents a focal point of human activity within a tributary area, the aspects of resettlement are both local and regional. Each village is concerned with streets, housing, and water supply as well as education, religion and the economic activities which support its inhabitants. At the same time, the areal interrelationships of communities overlap, requiring transportation to bind the total settlement pattern into a unified whole and to provide contact with outside areas. Thus, resettlement involves relationships with both site and situation if advantages are to be gained for economic and political unity.

Historical Development of Settlement Patterns

Whether the aboriginal form of occupation was the true village or the rural community cluster is unknown; but, regardless of type, the families of each clan were accustomed to living in proximity rather than in widely dispersed households. In 1680, the Spanish, in order to facilitate subjection of the Guamanian, required all the natives to abandon their settlements and move to village sites designated by the administration. This disrupted the ancient demographic patterns and established a new relationship between the people and their cultivated land. Since much time was consumed in movement between the villages and fields, it became customary for a farmer to build a shelter on his distant fields so that he and his family could live on the *rancho* when labor was required for three or four successive days. The Spanish-modified settlement forms were carried northward when Saipan and the other northern islands were resettled, and these patterns, established on the land, remain dominant. In the villages, the dwellings are arranged in rectangular blocks of irregular size, while the countryside is dotted with scattered farm houses for use when labor is required in the fields.

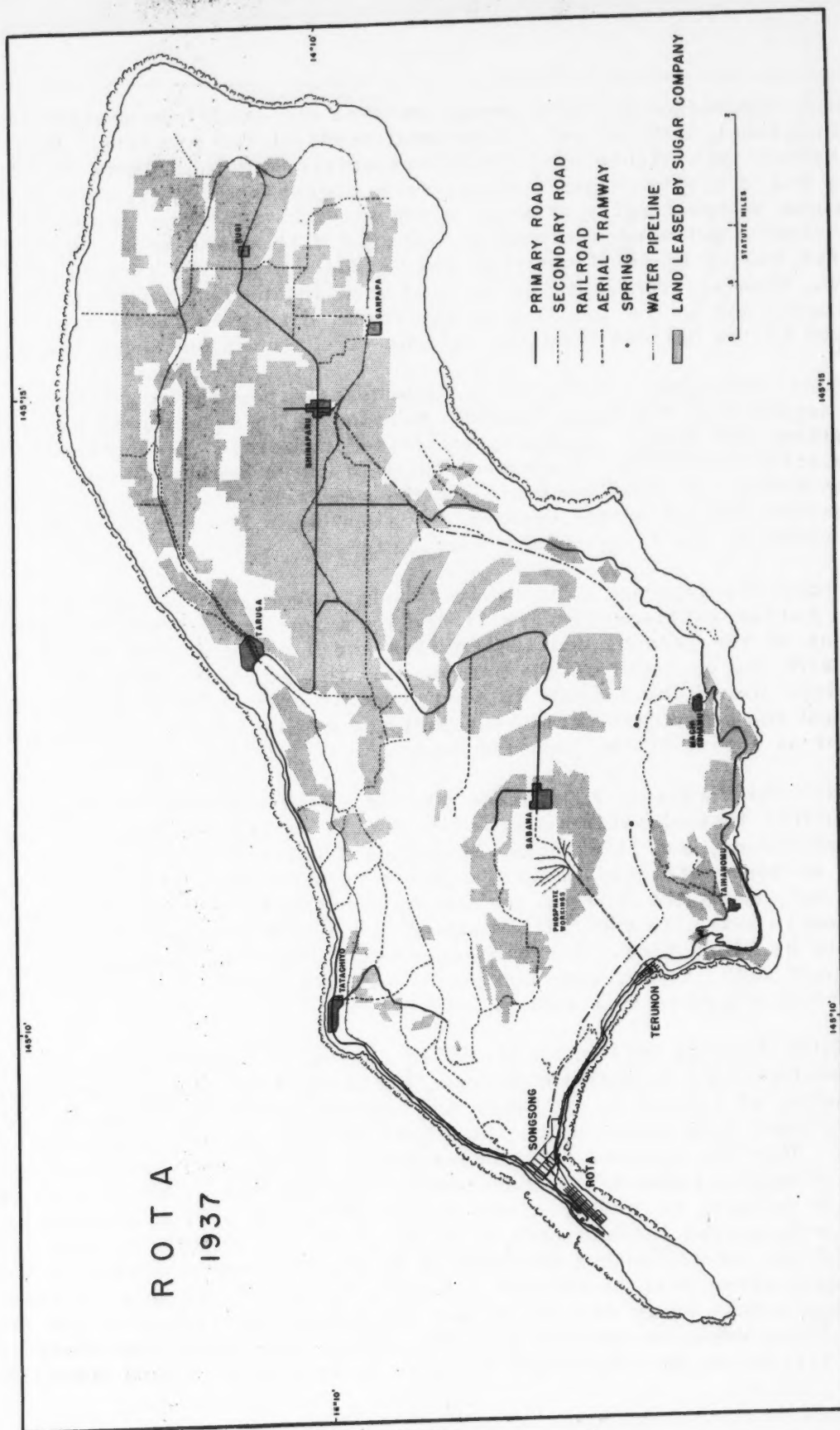
¹*Ibid.*, pp. 109-111.

The change effected in the aboriginal settlement pattern by the Spanish was accompanied by a gradual modification of the social life of the people. When the natives of Guam were settled in designated villages in 1680, and those from the northern islands settled on Guam between 1694 and 1698, the people were brought into closer contact with Spanish missionaries and administrators. The church became the hub of community life and exerted a strong influence over the lives of the people. As in the prehistoric village, the population continued to carry out certain social, economic and religious functions for the community as a whole. The people were united for religious services, for holy processions, for meetings, and for various economic activities such as planting, fishing, and house-building. When the villages increased in size, many of these joint economic functions dropped away and the extended family came to play a more important role as an economic unit. The church, however, remained as a unifying bond, and united the people in a common religion and way of thought.

Few foreign elements were added to the community scene during the German period, and the settlements retained their general Spanish-native character. The houses were mostly wood and thatch structures raised on piles and set apart from each other in orderly rows facing coral-paved streets. Additions to the villages, made necessary by population growth and a small migration from the Carolines, followed the rectangular block pattern. An administration building, hospital, school and homes for the few German officials were constructed in Garapan, and the harbor area was improved by the building of a pier. The small size of the population on Tinian made unnecessary any government work on the island, while on Rota, the former Spanish buildings provided adequate facilities for the single administrator sent to the island. Coral-surfaced roads were built to some of the native farm areas, replacing former foot paths and cart tracks, but inter-island and outside connections were infrequent, as in the Spanish regime.

Towns first developed in the Northern Marianas under the Japanese. Garapan and Songsong expanded from native villages to predominantly Japanese-inhabited settlements,¹ and Chalan Kanoa and Tinian Town were founded by the Japanese as the sugar industry prospered and population increased (Figs. 21, 41, and 42). Functional areas, commercial and industrial, reflected the new and more intensive use of the land, and the multiple activities of the settlements as compared with earlier periods. Whereas previously the church tower had dominated the sky line of the agricultural villages, factories and warehouses now rose above the dwellings of the residents. The palms and garden plots which had formerly merged the native villages into the countryside largely disappeared and the settlements were marked off sharply from the surrounding areas. Streets were paved, electric and telephone facilities

¹Japanese population statistics for the Northern Marianas include the population of towns and villages in totals for local administrative districts. In 1936, Garapan District was listed as having a population of 12,481; Chalan Kanoa District, 2,689. Tinian Town District, 4,727; Songsong District, 1,434. (Japanese Government, Saipan Branch Administration Office, *Descriptive Outline of Saipan*, 1938, trans. by Allied Translator and Interpreter Service, Southwest Pacific Section, Enemy Publications No. 42, 1947, p. 7.)



provided, the harbor and dock areas improved and buildings erected to serve the educational, medical and recreational needs of the populace. Most of the architecture was highly utilitarian--steel, cement and sheet metal. The houses built by the sugar company were stereotyped barrack-like cement structures systematically arranged along straight streets. As native income rose, cement and wooden structures roofed with sheet metal replaced the thatched houses of the Chamorros and Carolinians. The rectangular block pattern, however, continued to be used both in the expansion of the former settlements and in the founding of new towns, diverging little from the form followed by the natives when the islands were reoccupied under the Spanish.

Small villages, predominantly Japanese in population, grew up in the rural sections of the three islands, developing in relation to proximity to plantations and mines. Each served limited commercial, educational and administrative functions. There were three of these small villages on Saipan, four on Tinian and three on Rota. At the same time, the few small Carolinian settlements founded by the Germans on Saipan were disbanded and the inhabitants moved to the larger population centers.

Under the Japanese, the newly founded towns and villages and the expanded native settlements were linked by a road system which reached all sections of the island; and automobiles and bicycles moved in the traffic along with the ox carts of the natives and the Japanese immigrants. Steamship lines joined the islands into an economic unit and gave connection with Japan and the other districts of the Japanese mandated area, binding the whole together as a part of the Japanese Empire.

With the increase in Japanese population in the native villages, there was a further loss of joint economic and social activities among the Chamorros and Carolinians, and life became more individualistic. The population mass became an association of various classes stratified on ethnic and economic layers and, among the natives, the various functions which had previously been performed in community cooperation came to be carried on by small groups bound together by blood ties. One binding element, however, remained unchanged. The church with its services and young people's societies continued to hold the natives together in a common interest.

While foreign influences modified the native settlements and type of home construction, neither the Spanish, the Germans nor the Japanese disrupted the custom of living in villages and traveling to the farms, a familiar pattern over wide areas in the homeland of each of the successive ruling powers. Thus the natives, while essentially agriculturists, remain village rather than rural dwellers. Several hours a day may be spent with ox cart or afoot enroute to and from the *rancho* (Fig. 43). The average rate of travel over varied terrain with ox cart, is about two and one half miles an hour and the farmer, unless accompanied by his wife and children, or burdened by a load, often prefers to walk. During the busier seasons, a farmer may visit his *rancho* every day, or he and his family may remain on the farm for two or three days, or perhaps even the entire work week, but always return to the village on Saturday night in order to be able to attend Sunday morning mass.

The disadvantages of the inherited practice of village residence by the farmers presented American administration with a problem in the relocation of

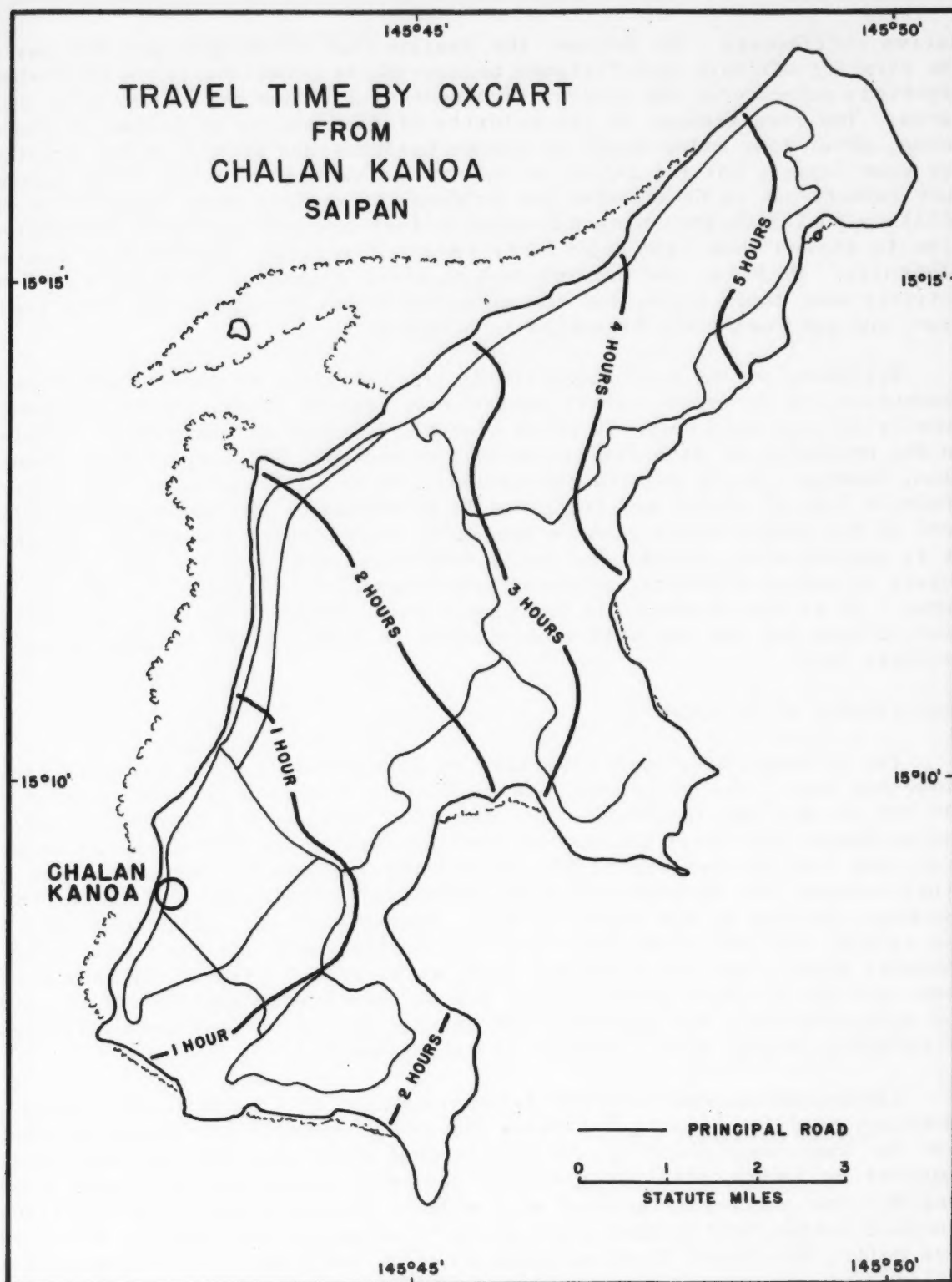


FIG. 43

native settlements. On Saipan, the destruction of Garapan and the use of the site for military installations because of its accessibility to the harbor, deprived a majority of the natives of a central location relatively near their farms. The resettlement of the majority of the natives of Saipan at Chalan Kanoa, about four miles south of former Garapan, was an off center position for some farmers but the situation was not as extreme as might first appear. Many farmers had to be allotted new holdings to replace those occupied by the military in the Garapan area and every effort was made by Civil Administration to assign them land near their resident village, unless they desired otherwise. On Rota, the natives had at first assembled on three sites relatively near their farms, but the arrangement was not compatible with tradition, and eventually all assembled in Songsong.

Residence on the farm would enable the islanders to devote more time to production and to protect their possessions against theft, and their animals from attacks by wild dogs. It would also eliminate the economic waste involved in the necessity of each family having two houses. The dispersal of population, however, would require the breaking of traditional practices and the probable loss of social and religious forms valued by the natives. Establishment of bus routes would also be necessary to transport the school children. It is questionable whether the gains from rural settlement would offset the losses in social cohesion, provided people could be persuaded to move to the farms. It is also doubtful if the people would respond; American administration in Guam has not met with much success in inducing the natives to settle on their land.

Resettlement of Villages

Ten villages have been resettled or established in the Saipan District since the war; five on Saipan, one on Tinian, one on Rota, two on Alamagan and one on Agrihan (Figs. 24, 44, and 45). During the American assault, Chalan Kanoa, the least damaged of the Japanese towns, served as an internment camp for the natives of Saipan and the islands to the north, and has since become the largest and most important settlement in the Northern Marianas, serving as the administrative, educational and religious center for the island, and the commercial focal point for the district. Only Rota is somewhat apart from its influence because of direct trade connections with Guam. All the villages rebuilt since the war are conditioned by former sites, and well illustrate the primacy of the established street and the difficulties of effecting change once a pattern is established.

Chalan Kanoa--The hurried reconstruction of Chalan Kanoa, under an immediate need for housing following the end of hostilities permitted little time for long-range planning. Internment camp structures and the less damaged Japanese buildings at first provided the only homes, but as lumber became available for purchase, families were able to construct individual dwellings, use-hold leases having been granted the natives for the lots on which they have built. The church first occupied a bombed building near the center of the village and, together with the village administration office, the clinic, and the parsonage, formed a community center. A nearby plaza, located at the entrance to the village from the main coastal highway, and the school provide space for community gatherings other than those of a religious nature. South of the plaza, the Carolinians have built a small community hall for meetings,

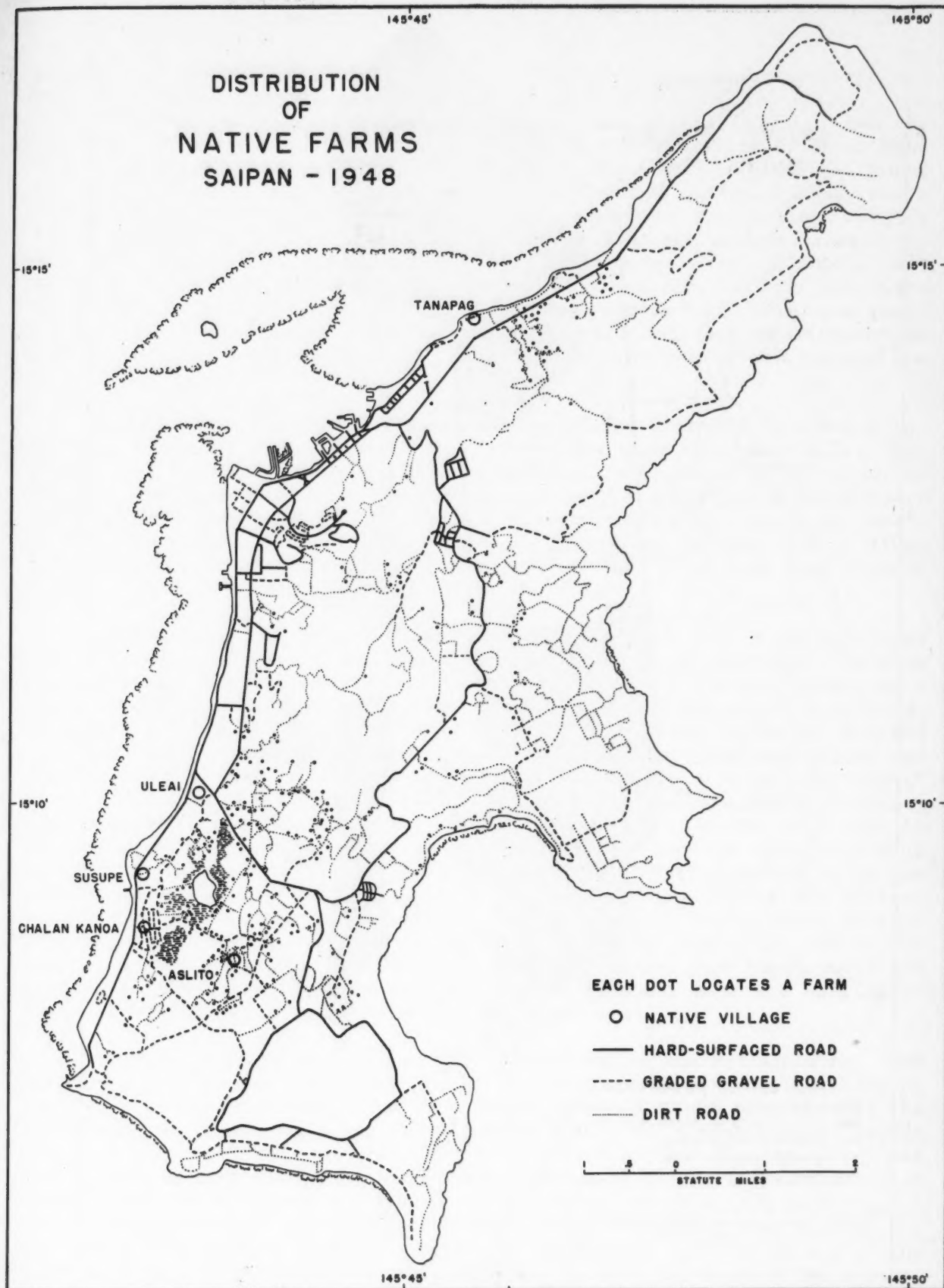


FIG. 44

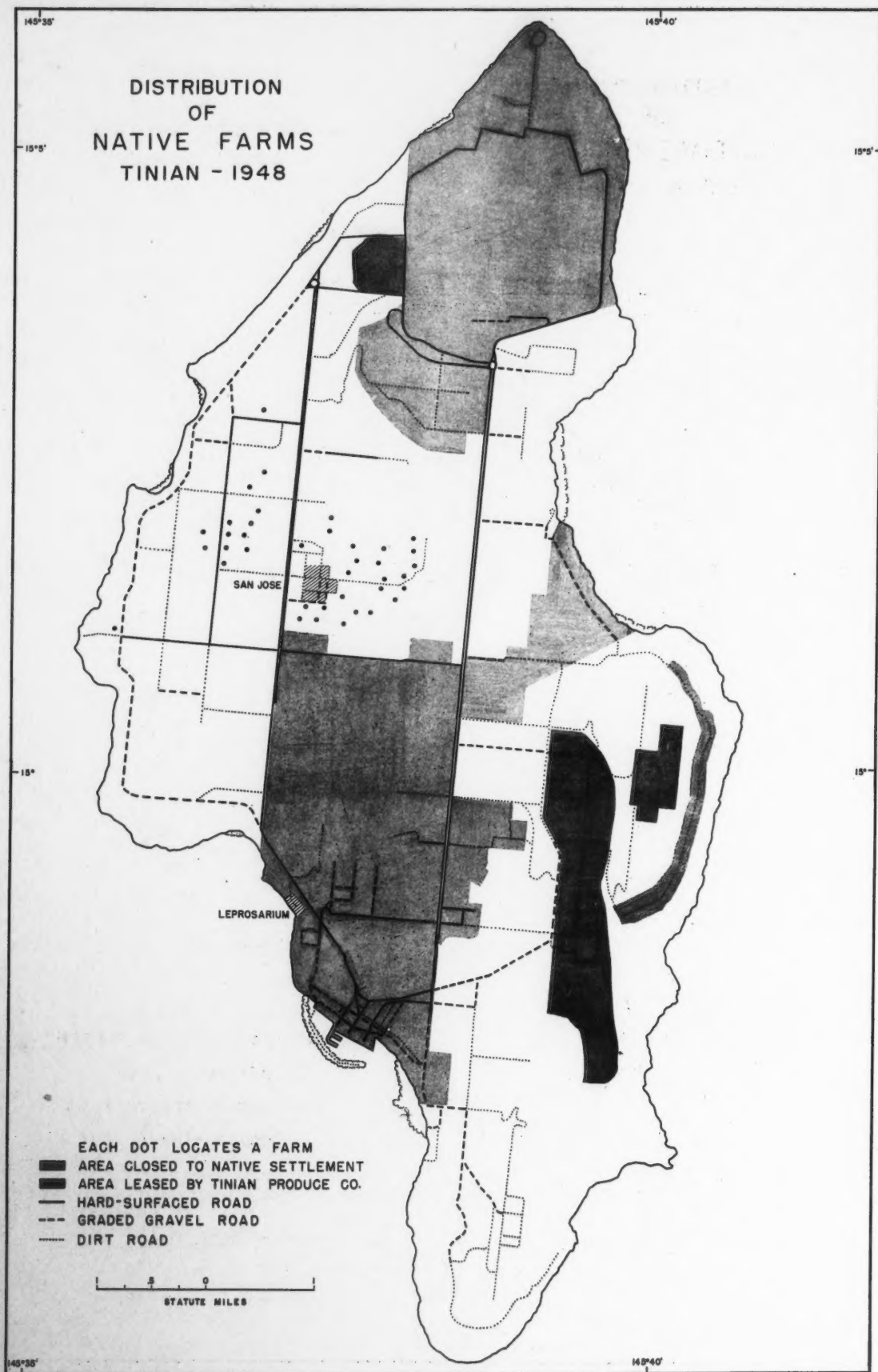


FIG. 45

parties and the assembly of workers cooperating in some common enterprise. With the construction of a new church at the northern edge of the village, the former church building also became a public hall available for community meetings. Commercial activities are scattered throughout the village, generally in relation to easy accessibility from the home of the owner, but a business core is developing along the main north-south coastal highway which passes through the village on the west. Because of the restrictions against the free access of military and civilian personnel to the village, some of the more enterprising business men have located their shops along the public road in order to attract customers from the passing traffic. Stands have been built for the sale of farm produce, ice cream, popcorn and hamburger sandwiches; and restaurants, barbershops, handicraft and general merchandise stores have been established to cater to both the native and non-native market.

Chalan Kanoa has expanded somewhat beyond the original Japanese site, forming a roughly rectangular area of about one quarter square mile. The population is approximately 3,950 as compared with about 2,689 prior to American invasion. Growth of the village southward was restricted by military installations, westward by the lagoon bordering the lowland plain and eastward by the marshes bordering Lake Susupe. Expansion northward was at first somewhat hampered by the ruins of the sugar mill, but these have been cleared in part, and a new church constructed in the area.

Several natural features of the Chalan Kanoa site afford opportunities for community improvement and beautification. The large open area fronting the newly constructed church presents possibilities for the development of a plaza around which future government and public buildings could be erected. With some filling, the higher western shore of Lake Susupe could be utilized as a small park easily accessible from the village area. The lake itself and the adjacent marshes, one of the few remaining habitats of the now almost extinct Marianas Duck (*Anas. oustaleti*), should be set aside as a bird sanctuary and preserved as a natural area for scientific study. On the west side of the village, the beach areas facing the lagoon should be kept open for public use and not usurped for the building of homes. Planting of strand trees and plants are needed to bind the sand on the beach ridge. While the village budget does not at present permit an expenditure for parks, much initial clearing and planting could be accomplished through the schools, the church societies, and community association. Plantings around more homes would add greatly to the attractiveness of the village, as would also the setting of trees along the streets in the newly developed sections.

A number of other problems present themselves in the village area. The arrangement of houses in the portion of the village first rebuilt following the end of hostilities creates a fire hazard because of the closeness of the buildings. As more people are able to build homes for themselves, it may be possible to remove some of the older structures so that the buildings are more safely spaced. The maintenance and drainage of the coral-paved and dirt streets and the extension of roadways into the recently opened sections of the village presents problems which cannot be completely met within the limitations of village finance. Water and sanitation facilities are of the internment camp type and are quite inadequate to meet the needs of the present population. Except for the newer portions of the village, water is supplied from public taps placed at intervals along the streets, averaging about one

source for every ten to fifteen houses. Toilet facilities and showers are consolidated in ten public *benjos*. In the recent additions to the village, many of the residents depend upon catching rainwater, and a few have private outside toilets. Again, the critical factor in improvement is the small village budget, and the problem of increasing taxes before the islands become more productive.

Susupe, Saipan--Susupe, immediately north of Chalan Kanoa, was a temporary settlement abandoned in 1949. Susupe was settled by a number of native families who elected to move from their crowded quarters in Chalan Kanoa to the former Korean internment camp after the repatriation of the Japanese nationals in 1946. Later 260 immigrant Chamorros from Yap joined this group raising the population to 380 and giving the community its alternative name of Yap Town. No modifications were made in the original internment camp which consisted of six barracks arranged around a quadrangle. Space in each twenty-room structure was allotted on a basis of family size, but because of housing pressure, no family could be assigned more than two rooms. The inner quadrangle came to be a center of community life serving a variety of functions. Here the children played, and the parents worked, rested and talked in the evening. Here too each family built its cook house, dried the laundry either on lines or on the grass, stored lumber and other possessions for which there was no room inside, and sometimes cultivated flower and vegetable gardens and penned chickens (Fig. 46). Two centrally located *benjos* served the community, and water was supplied from taps located every twenty-five feet along the length of each building. In spite of the short distance to Chalan Kanoa, commercial enterprise developed to a greater extent here than in any of the other small villages on Saipan, a response to location along the main coastal highway with attendant possibilities of attracting the non-native market. Businesses included two stores, an ice cream parlor, and a shop where beer could be purchased. Now that the former camp buildings have been razed, the Susupe area will probably be taken over eventually by the northward expansion of Chalan Kanoa.

Aslito, Saipan--Aslito, located on a hillside site on the western edge of the southern plateau, was established in July of 1946 to relieve housing pressure in Chalan Kanoa and to place the farmers who cultivated land on the plateau in closer proximity to their fields. The village, the first venture outside the former civilian internment area, bears little resemblance to a native settlement as the inhabitants have occupied abandoned quonsets and barracks in a former naval area. Traditional cook houses have been added, either attached to the military buildings or set apart as separate units. Part of one of the larger buildings has been set aside as a community hall. One store and a bakery serve the community and a former military chapel was reconditioned for a church.

The village has a pleasant setting which affords possibilities for development and community improvement. However, since settlement, the population has declined from 377 to 237, many of the residents having returned to Chalan Kanoa because of dissatisfaction with local facilities and a feeling of living apart from the main native settlement. All water must be carted to the village, as connections have not been made with the island's water mains and few natives have provided themselves with cisterns. The electric generator, operated by a Diesel engine, was reported to be out of repair most of the time. School children are transported to Chalan Kanoa, but parents desire



FIG. 46. Saipan: Scene in former Susupe Village. Dwellings were former internment camp barracks. Note row of cook houses, one for each family.

a local school and worry about their children traveling over rough roads in the buses. Another problem awaiting solution by the Land Commission is that of land titles in the village area; the present homes in the former military buildings are on native land to which the residents do not have claim.

The problems of Aslito are typical of those of the smaller villages founded or established since the war and arise from a lack of funds to restore former services. In the Japanese period, the natives received public benefits far greater than the extent of their tax contribution and the majority do not have an appreciation of the cost of the public projects which they now desire. The restoration of many facilities, if supported locally, is dependent upon increased taxation which, with the withdrawal of American personnel and the accompanying decrease in native employment, can be supported only by the establishment of a firm economic structure based on local resources. A second solution would be the reconstruction of lost facilities by the American government; but the appropriation of necessary funds by Congress is not likely, nor is extensive direct aid deemed advisable if the people are to retain their initiative.

Uleai, Saipan--The village of Uleai was established in May, 1947 under the auspices of the Civil Administration and the U.S.C.C. for the purpose of placing some of the farmers nearer their *ranchos* than they had been in Chalan Kanoa. Before resettlement, the owners who held land on the site agreed to accept property elsewhere in return for that lost by the building of the village, so that all titles were cleared before the site was occupied.

The site of Uleai, a level area on the lowland plain, had originally been settled in the German period by a group of Carolinians from the island of Woleai, following the destruction of their homes by a typhoon. Eventually most of the inhabitants returned to the Carolines and the site passed into the possession of Saipanese natives who leased it to the Japanese for vegetable farming. In 1945, one of the several Japanese internment camps was built in the area, imprinting a pattern which was later followed in the laying out of the new village (Figs. 27 and 47). The houses are arranged around the quadrangle formerly enclosed by the barracks in which the Japanese were housed. All the houses face outward toward an encircling road, and cook houses have been constructed in the open interior. There are fewer trees than in the quadrangle at former Susupe, and plantings are needed to relieve the village of its present bleak appearance. A small Catholic church has been built on the west side of the settlement. One small store is in operation, but the residents are mainly dependent for shopping upon Chalan Kanoa, about 1.4 miles southward. Five water taps and two *benjos* from the former internment camp serve the community. Plans for the resettlement of a hundred or more families at Uleai did not materialize. The population in August of 1948 was only 26 families, or 130 persons. All of these were Chamorro. The problems of Uleai are in some respects similar to those of Aslito. Although there are only about twenty-five children of school age, a school is desired rather than the transportation of the children to Chalan Kanoa or, as was expressed by one parent, 'We are ashamed not to have a school.' Residents of this village had begun plans for the construction of a community oven in order to avoid the trip to Chalan Kanoa for bread. The homes were without electricity in 1948 but have now been connected with Island Power, an electrical plant operated by the military. As in Aslito, some of the families feel apart from the Chamorro community, and a few expressed a desire to return to Chalan Kanoa if their houses could be moved.

Tanapag, Saipan--Tanapag, situated on a Carolinian village site dating from the late Spanish period, was almost entirely a native settlement prior to its destruction in World War II. Native informants stated that they believed it was originally settled by Carolinians who moved from Tinian after the termination of the hunting and farming project initiated by Johnson. In the late German or early Japanese period, the residents were induced to settle in the Puerto Rico District north of Mutcho Point because of the danger of flooding during typhoons, but eventually most of the inhabitants returned to the site at Tanapag. Tanapag was resettled in the spring of 1948 by former residents who were eager to return because their farms lay within one and one half miles of the village, and the lagoon, on which the settlement is located, is an excellent fishing area. The strong desire to reoccupy the site well illustrates the native feeling of being at home when traditional rather than new sites are occupied in resettlement. Considerable confusion resulted over property holdings, as the site has been hemmed in, and in part occupied by military holdings (Fig. 38). New homes have been built and an unused military structure moved in to replace the destroyed church. Population as of August, 1948 was 275, of which 115 were Chamorros. Two or three of the houses have been built unduly close to the road which serves as the main street. It would be well to align the streets as soon as possible if the houses are to be well placed. Problems mentioned by the inhabitants included: acquiring electricity, telephone connections with Chalan Kanoa, a water supply other than rain catchment, and land for a cemetery.

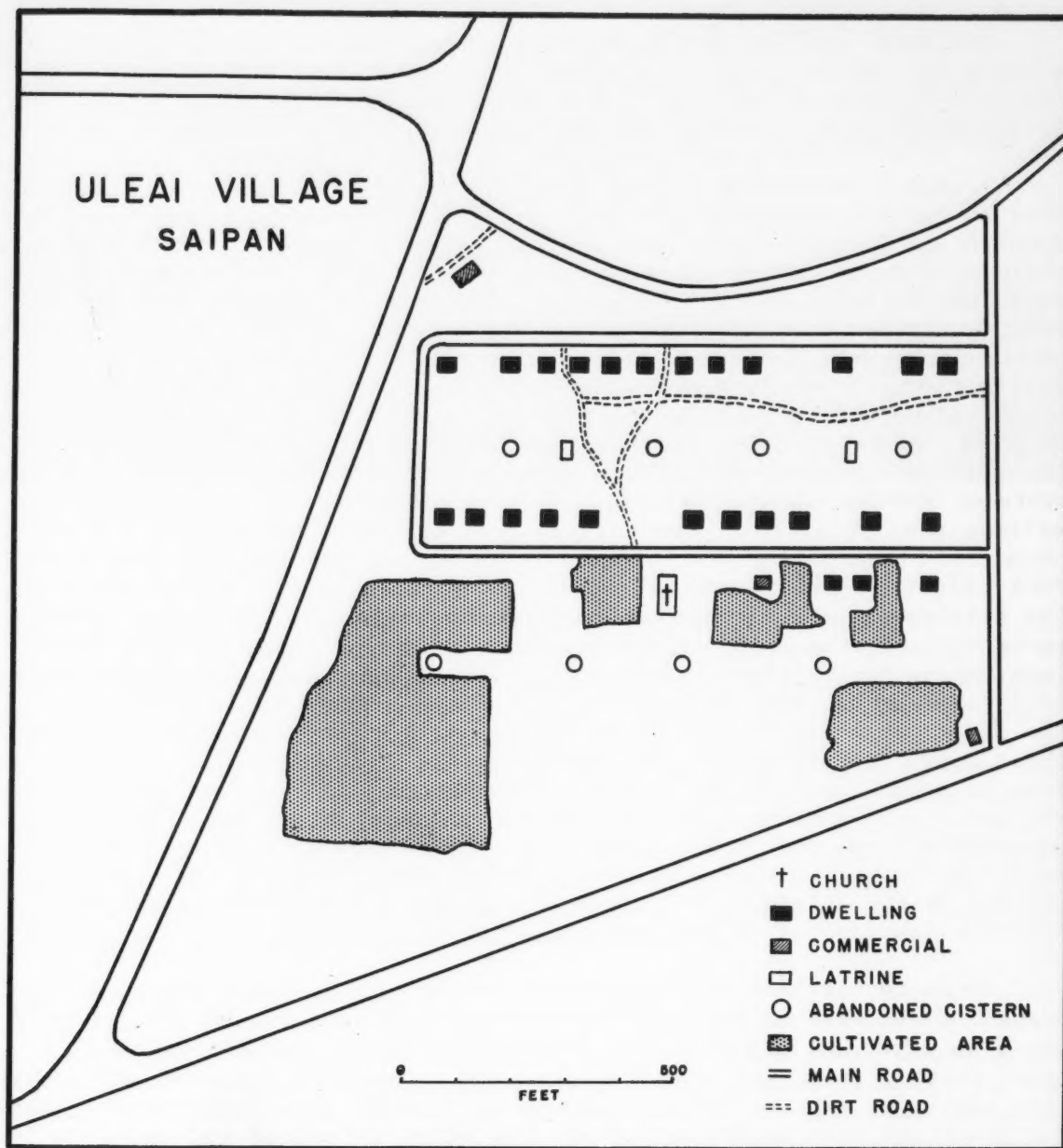


FIG. 47

San Antonio, Saipan--San Antonio, settled at the time of the abandonment of Susupe, is located less than one half mile south of Chalan Kanoa, in a former military housing area. The group which moved from Susupe has been joined by a few others from Chalan Kanoa; together they have a population of about three hundred.

San Jose, Tinian--The settlement of San Jose resembles Aslito and San Antonio, in that it occupies a former American quonset and barracks area. It was settled in April of 1947 by Chamorro immigrants from Yap Island. Population as of June 30, 1949, was 354.

Songsong, Rota--The site of Songsong has been almost continuously occupied by native homes for the last three centuries (Fig. 48). During the Spanish and German regimes the village here was the only settlement on the island. Change had been slow in both periods. Between 1914 and 1944, however, the village was rapidly modified, paralleling in many respects a similar transition in all the native villages in the Northern Marianas occupied by the Japanese. When Japan acquired the islands, Songsong was an isolated village with a population of about 480 persons who supported themselves primarily by subsistence agriculture (Fig. 49). One store served the needs of the community. Aside from the coral-surfaced streets built by the Germans, the village differed little in appearance from that during the last fifty years of Spanish administration. Under the Japanese, Songsong became a sugar-milling town (Fig. 50). The village area was extended and new streets constructed. Some of these were paved. The harbor was improved so ships could dock, electric and telephone facilities were installed, water was piped to the settlement, and commercial and governmental activities were expanded to serve the incoming colonists. A Japanese residential area was developed apart from the native settlement, but as population increased, the native residents were required to move to Tatacho, and their vacated homes were occupied by the Japanese. Just prior to World War II, the population of Songsong was about 1,500. Although several villages were founded on Rota, none of these came to equal Songsong in size or importance. Rota was not invaded during the war, but Songsong was destroyed by bombing (Fig. 51). When Military Government took over the island after the end of hostilities, the natives were eager to rebuild on their traditional site. Songsong is again the only village on the island. Its population of 680 supports itself mainly by subsistence farming, as in the Spanish and German periods.

Songsong has been handicapped by the lack of building material. Unlike Saipan, there were no abandoned quonset or barrack areas on the island which could be occupied or serve as a source of materials for construction. The procurement of necessary supplies was made a community project, and, with the navy supplying transportation, lumber was brought from the vacated Civil Administration area on Tinian after the repatriation of the Japanese. The materials obtained, along with salvage from ruins on Rota, provided lumber for home construction. As a result, most of the dwellings are below the standard of those on Saipan. Within the last year, however, the buildings have been painted, and the village has taken on a more attractive appearance. After the ruins of the former town had been cleared away, the natives constructed their homes along the shores of the isthmus (Fig. 52). A large open area separates the village proper from the offices of village government and affords opportunity for park development. A new church and parsonage are being built. Meanwhile a temporary sheet metal structure is in use for



FIG. 48. Rota: Site of Songsong Village.

services. The school occupies a former Japanese hospital building on a hill overlooking the village. Because of lack of materials, the building has not been completely repaired. In proportion to the size of the population, Songsong has not had the commercial development equivalent to that of Chalan Kanoa, because of the lack of a non-native market. Only two stores, one barber shop, and a restaurant which serves occasional visitors, have been opened. Songsong has two advantages lacking in the villages of Saipan. A fresh water supply, available without pumping, is piped from upland pools in the volcanic area on the southeast side of the island. Also, in the cliff immediately north of the village is a large cave, which throughout the centuries, has served as a typhoon shelter. It is of sufficient size to protect the entire present population of Songsong.

House Types

Prior to the war, the average native house was a one story wooden building, roofed with sheet metal or thatch and consisting of from two to four rooms, and a detached cook house. The main portion of the house and sometimes the cook house was raised about two feet above the ground by wooden or cement piles to give protection against dampness and to permit the air to circulate under the floor for coolness. Beginning about 1920, the trend in new construction was toward the use of cement instead of wood. Some of the newer homes had cement floors, and others, particularly on Saipan, were constructed with cement walls. The use of cement as a building material made it necessary to set the house directly on the ground, but the general plan of the building remained the same, a combination of native and adopted elements.

SONGSONG
ROTA ISLAND
ABOUT 1913

COMMUNITY COCONUT GROVE

ROAD OR STREET

RESIDENCE

1 GERMAN GOVERNMENT ADMINISTRATIVE AREA

2 JAPANESE-OWNED STORE

3 CONVENTO

4 CHURCH

5 OLD SPANISH GOVERNMENT OFFICE

6 BOAT HOUSE

xxx FENCE ENCLOSING DEER RESERVE

- - - EDGE OF STEEP TERRACE CLIFF

0 800 1000 1800 2000

APPROXIMATE SCALE IN FEET

108

SONGSONG
AND
ROTA VILLAGE
ROTA ISLAND
1943

SONGSONG

ROTA

NANYO KOHATSU KAISHA
(SOUTH SEAS DEVELOPMENT CO.)

HOSPITAL

CRANES

PAPAYAS

LEGEND:

- ✕ RAILROAD
- ROAD OR STREET
- RESIDENCE
- ⊠ RELIGIOUS (SHRINE)
- GOVERNMENTAL
- ◼ RETAIL
- ⊞ SERVICES
- ▨ WHOLESALE (INCLUDING WAREHOUSES)
- ▩ PRIMARY PROCESSING OR MANUFACTURE
- 1 PAPAYA LATEX
- 2 WAX FROM IFIL TREE
- 3 TAPIOCA
- 4 SAKI AND OTHER BEVERAGES
- 5 COTTON MATTRESSES
- 6 TOFU
- 7 CASTOR BEANS
- 8 FISH-DRYING
- 9 RICE-HULLING
- 10 N.K.K. ALCOHOL DISTILLERY
- 11 N.K.K. SUGAR MILL
- 12 BOAT-MAKING AND REPAIR
- ⋯ RECREATIONAL AREA
- - - EDGE OF STEEP TERRACE CLIFF

0 500 1000 1500 2000
APPROXIMATE SCALE IN FEET

"SERVICES" INCLUDE HOTELS, RESTAURANTS, TAXI STANDS, GARAGES, BARBER SHOPS, PUBLIC BATHS, DOCTORS, DENTISTS, MOVIES, AND GEISHA HOUSES

109

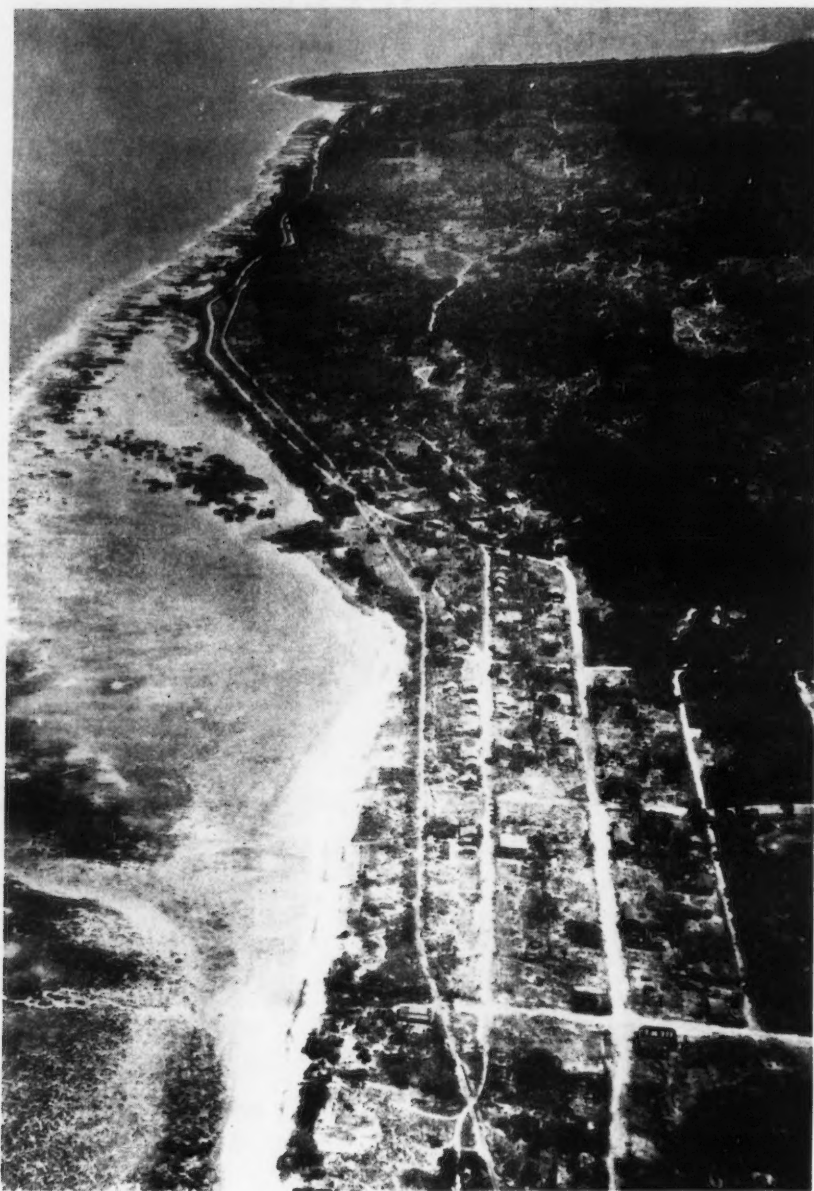


FIG. 51. Rota: Songsong village at end of war. The new village built on the site follows the former street pattern.

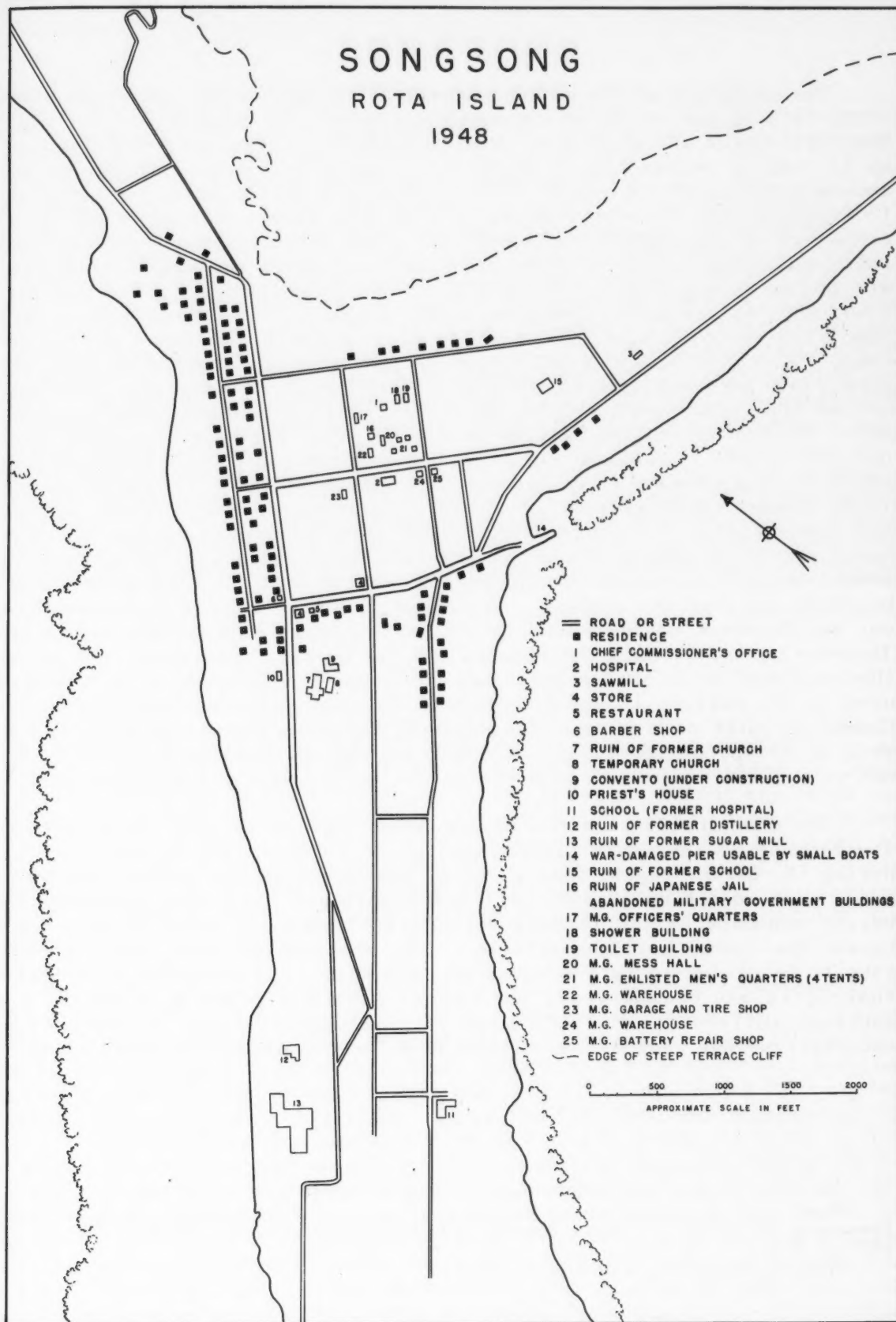


FIG. 52

The evolution of the native house type in the Northern Marianas shows an adaptation to new construction materials under the several foreign regimes. Descriptions of the aboriginal dwellings left by voyagers are so inadequate as to make it impossible to picture the early buildings with any degree of accuracy. Legaspi, who took formal possession of the Marianas for Spain in 1565, wrote that the sleeping quarters of the natives were supported by stone pillars, and the cooking sheds and work shops were set on the ground. Beside these structures, there were large buildings which served as store houses for all in common and others which sheltered the large canoes.¹ The early missionaries who began work in the Marianas in 1668, described rectangular, pile-supported thatched houses consisting of four rooms, one used as a sleeping room, the second for storage space, the third as a kitchen, and the fourth as a canoe shed and work shop.² In many respects these dwellings must have had an appearance very similar to the average farm house prevalent on Guam about 1900, described by Safford as 'a shed with walls of woven reeds, coconut leaves, or split bamboo, and a coconut thatched roof with projecting eaves to keep the rain from coming through the cracks.'³ The floor was of sawed timber. Windows were protected by shutters of woven reeds and bamboo, and the entrance was frequently protected with a roof. Stakes raised the house above the ground, usually to a height of about two feet, but in some cases, the elevation was as much as five or six feet, and the space under the building was used for storage. Houses of this type were predominant throughout the Northern Marianas during the late Spanish, the German and the early Japanese periods. Both the Spanish and the Germans used stone and mortar in the construction of public buildings on Saipan and Rota, but masonry was never used by the natives in building homes. On Guam, in contrast, the wealthier Chamorros built with stone. The style of these dwellings, built with a basement or *bodega* on the first floor and living quarters on the second floor, had very little influence on architecture in the Northern Marianas (Fig. 53).

The modifications in the native house type which were to result in the development of the style predominant prior to World War II were introduced during the German regime when a few of the wealthier natives on Saipan built homes with wooden walls and sheet iron roofing. Under the Japanese, lumber became abundant as the forests were cleared away for agriculture, and wood became the common building material. The sheet metal roof, once introduced, came to be preferred by the natives. Although it transmitted more heat than thatch, it was cleaner, did not harbor rats and insects, and made a more sanitary surface for the catchment of rain water. Prior to the war, about seventy-five per cent of the native homes were roofed with sheet metal. The

¹As stated by Blair and Robertson, *The Philippine Islands*, Vol. II, p. 113.

²Padre Francisco Garcia, *Vida y Martyrio de el Venerable Padre Diego Luis de Sanvitores de la Compania de Jesus*, Madrid: 1683. Translation by Margaret Higgins, Guam Recorder, Vol. IV (April, 1937) p. 21.

³Safford, *Useful Plants of Guam*, p. 124.

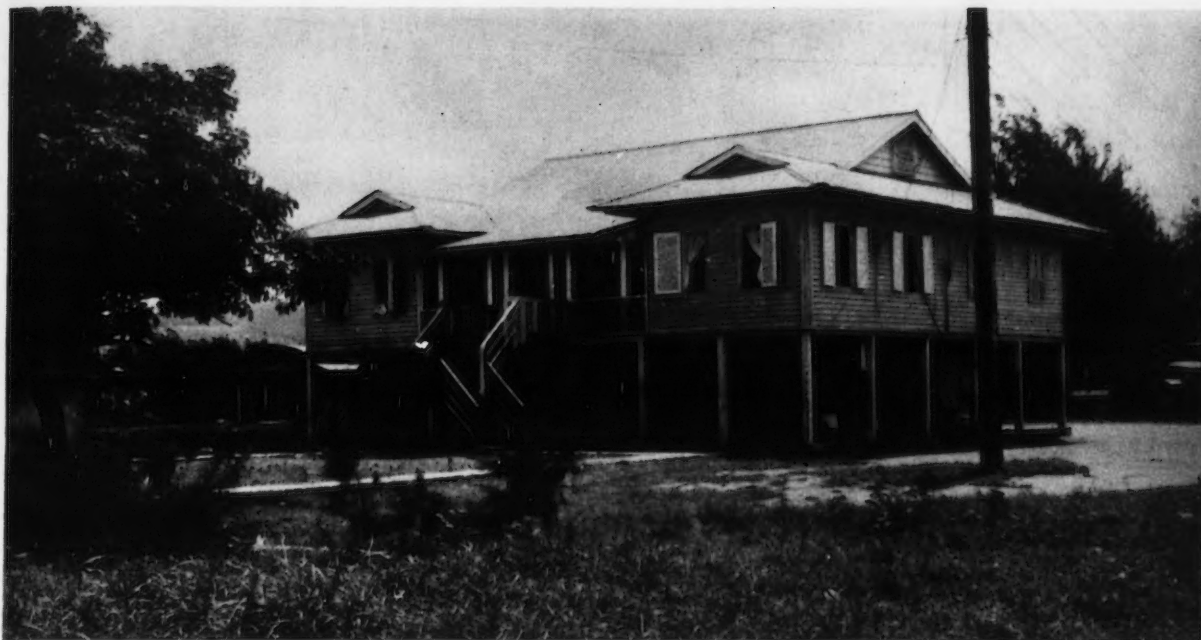


FIG. 53. Saipan: *Bodega* type house. Basement on lower floor, living quarters on second floor. One of the few examples of this type of dwelling in the Northern Marianas.

trend toward the use of cement in home construction which began in the middle of the Japanese period, arose in part from the shortage of lumber following the depletion of the forests on the islands. Cement was first utilized by the natives in the building of cisterns for which the Japanese Government offered subsidies. Some of the natives, particularly on Saipan, had sufficient capital to build cement houses. These were regarded as both typhoon and earthquake proof, and came to be the preferred type of dwelling. The average native, however, could not afford a home of this type, but frequently used cement floors.

The dwellings on Saipan which have replaced those destroyed during the assault are referred to by the natives as being of 'American' or 'Navy' style, although they bear many resemblances to the prewar type of dwelling. Usually consisting of two or three rooms, backed by a cook house and sometimes fronted by a porch, the present house type gives the impression of a cottage or bungalow set on piles (Fig. 54). Since few families make much use of the porch, it is sometimes enclosed to serve as an extra room. A large part of the family's activity goes on in the cook house and the intervening yard or porchway which gives connection with the main portion of the dwelling. Here food is prepared, the children play and the family gathers to eat, work, and visit with the neighbors. Cook houses vary considerably in size and construction. Sometimes they are little more than unfloored open sheds containing the metal-lined sand and ash box where cooking is done on an open fire, with the help of stones and grills to keep the utensils in position. If possible, the stove shelf is always placed on the side of the kitchen away from the



FIG. 54. Saipan: Native homes. Typical of the type built by the average family.

prevailing wind; otherwise, boards are needed to keep the smoke and flames from blowing directly through the cook house. Other cook houses are large enough to provide dining space and sometimes contain an additional room for general storage and use as a workshop. Estimates as to the cost of an average house vary greatly from one native to another, depending on how much labor was employed. The costs quoted usually range from \$350.00 to \$600.00 (Fig. 54). A few families which have accumulated capital since American occupation have been able to build homes larger and more varied than the average and ranging into costs up to \$3000.00 (Figs. 53 and 55). These usually include the kitchen as an integral part of the house rather than as a separate building. Materials for building are obtained by purchase from American military units which have surplus lumber available from abandoned installations. All construction since the war has been of wood.

Intervillage Land Transportation

As a result of American military occupation, Saipan and Tinian have a better pattern of main roads than before the war, the system on Tinian being especially excellent (Fig. 45). Since the withdrawal of American troops from Tinian, the roads have had no maintenance; however, they remain in good condition because of the excellence of construction and present lack of use. Since the island is tabular, there has been very little road damage by washing and erosion. All sections of the islands are easily accessible over good roads from the settlement of San Jose. On Saipan, the roads were more hurriedly laid and those along the western coast have received continuous use (Fig. 44). All roads required for travel between active military areas have

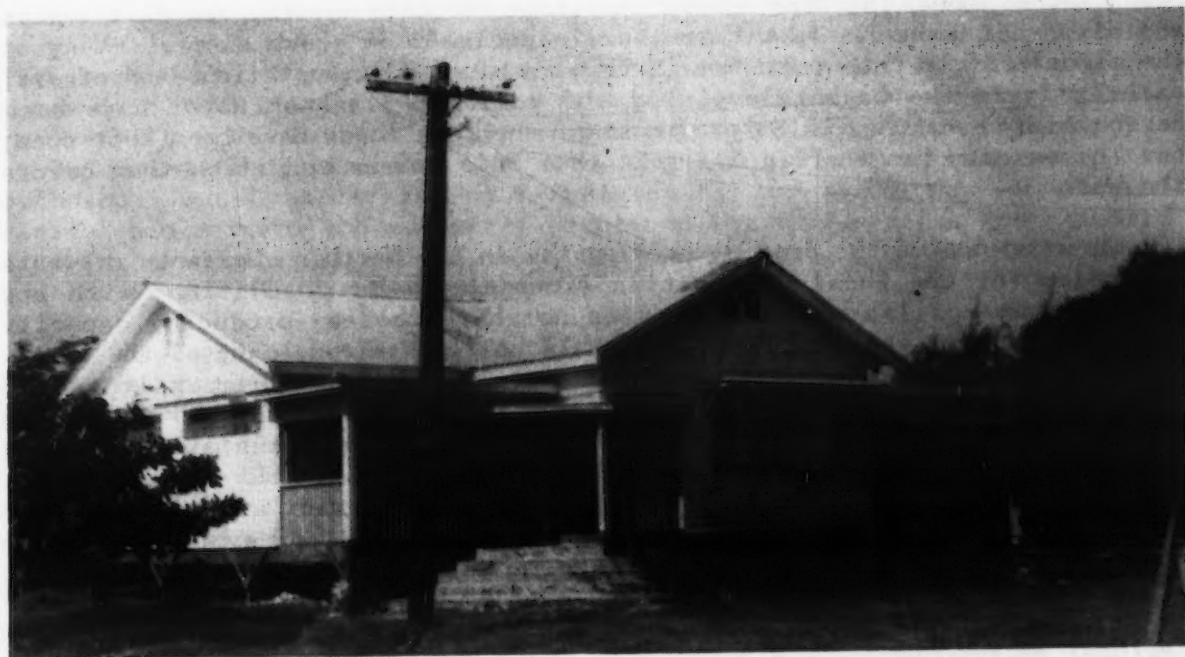


FIG. 55. Saipan: A six-room house.

been kept in good repair, but the coral-surfaced highways in the unoccupied portions of the islands are washing and gullying on the steeper slopes. Connections between the settlements correlate with the main roads used by the military and are in good condition except for the short stretch between Chalan Kanoa and Aslito, and between Tanapag and the main road. A bus system, operated by the military, serves both the native and non-native public. On Rota, American occupance was so brief that little work was done on roadways except as immediate repairs were needed (Fig. 24). For a time, portions of the main road encircling the southern and central parts of the island were so overgrown with tall grasses as to be impassable, but this vegetation has now been cleared away. The farm roads, away from the main system, are dirt tracks and often not jeepable in wet weather, especially on steep slopes. Many of the minor roads on Tinian and Rota have been blocked by vegetation, and others, especially in the higher levels of the volcanic areas on Rota, have been destroyed by erosion. On Saipan, most of the farm roads have been kept open, but increased motor traffic has left them in a poorer condition than before the war.

Maintenance of the present road system in the Northern Marianas presents a problem for the local communities since the small population, with its lack of commercial productivity, does not have the tax-producing capacity necessary to keep the roads in repair. If not maintained, many of the coral-surfaced and dirt roads will fall into ruin and require expenditure for rebuilding as the population increases and wider areas are brought back into cultivation. Making labor on roads compulsory as the Germans did on Rota is not consistent with American policy, but with the approval of the village councils and public opinion, it might be possible to enact a road tax, which if not paid in cash, could be met by a certain number of days labor on the roads. While this procedure would not completely take care of maintenance, it would be of some aid in meeting the problem.

Regional Settlement

The present distribution of settlement in the Northern Marianas is a distinct handicap to administration, public welfare, and commercial development (Fig. 35). The arrangement of the total population, numbering little more than that of a small American town, on five islands, distributed over a linear distance of 290 miles, disperses the human energy of the group over too wide an area for effective economic development. With limited and irregular transportation, it also makes difficult the fusion of the total group into a cohesive whole and the supply of desired services to the scattered settlements. In most instances, the present distribution of settlement is based on tradition and in a sense represents a conflict between economic feasibility and human values. While compulsory resettlement of the people is not consistent with American policy, it would be well to shape native attitudes to prevent further scattering of the people until population increases.

Resettlement of Alamagan and Agrihan--Alamagan and Agrihan were resettled in early 1948 as a project of the Northern Marianas Development Company, a native association incorporated on Saipan to engage in copra production. Twenty-seven men formed an advance party preceding settlement on Alamagan to clear the former village sites and to repair the abandoned buildings for occupancy. Plans to leave thirty-three men on Agrihan for the same purpose miscarried because heavy surf made landing impossible. The main

body of settlers moved in March; 112 persons were landed on Alamagan and 116 on Agrihan. Others followed and by June 30, 1949, the population on Alamagan numbered 138 and that on Agrihan, 146.¹ Both islands now have a larger number of people than in the Japanese period--Alamagan by 466 per cent and Agrihan by 78 per cent. On Alamagan, the people are resident in two villages--Song-song on the southeast coast and Pattico on the southwest coast. Because of difficult terrain, travel overland between the two settlements is impossible, and all inter-village communication is dependent upon fair weather and movement by boat. Thus each village must be considered as a separate isolated unit requiring a school, church and hospital facilities. It has been impossible to fully meet these needs or those of the village on Agrihan. There is every likelihood that the people on the two islands will never be able to rise above the subsistence level, and that the greater part of the funds for supply of public services must come from the larger islands in the administrative district. Each of these islands supported a small permanent population during the Japanese period (Fig. 35) but the copra industry in the northern islands was carried on largely by migrant workers. The present relationship between the number of people on the two islands, the standard of living which they hope to attain, and the supporting power of the copra industry is one of overpopulation.

*Pagan--*Pagan has been visited by representatives of Civil Administration with a view toward the possibilities of resettlement. The island is larger and has more level land than either of the two northern islands now occupied, but is still retained as a military area. Prior to the war, Pagan supported a population of 220.

*Resettlement of Tinian--*The value of channeling settlement toward Tinian in order to avoid widespread dispersal of population was early recognized by the administration, but was retarded by traditional native attitudes toward the island. Tinian has not been a major native occupance area since depopulation by the Spanish in 1694. The few Chamorros and Carolinians on the island at the time the Japanese assumed possession were given land in exchange on Saipan. Only five or six natives lived on Tinian prior to the war; these were employed by the Japanese in Tinian Town and held no property on the island. Tinian is also linked in the minds of some of the natives as being the home of powerful Taotaomona, in whom they may profess disbelief, but nonetheless, the superstition colors their thinking. This attitude has now been largely broken down by frequent trips of the natives to Tinian to obtain lumber and other salvage materials, the settlement of the island by a colony of Chamorros from Yap, and the employment of Saipanese on the island by stevedoring companies engaged in removing surplus naval supplies. Resettlement here has the advantage of involving no question of property rights as the entire island was held in ownership by the Japanese Government. The island has an excellent harbor and is easily accessible from Saipan.

Migration of the Chamorros from Yap was the outgrowth of social, political and economic tensions arising from cultural incompatibility with the

¹U. S. Navy Department, Civil Administration Unit, Saipan, 'Quarterly Report, April 1-June 30, 1949.'

Carolinian majority on the island. The first Chamorros came to Yap as refugees from the native-Spanish wars in the Marianas during the seventeenth century, and others followed during the German and Japanese periods, induced to migrate by government officials to meet labor needs. When the Americans occupied the island the Chamorros numbered about 500 in a total population group of 2,805. Preferential treatment of the Chamorros under previous regimes had aroused a strong current of antagonism among the Carolinians, as did also the Chamorro dominance of economic activity. The Chamorros were not assimilable into the Carolinian political structure; they did not feel themselves morally subject to the decisions of the Yap Council, while the Carolinians regarded the Chamorros, especially those who held official positions under the Americans, as petty overlords from the Japanese period.¹ Efforts of the authorities to avoid favoritism in appointing natives for government employment and giving aid for economic enterprises lead to a feeling of insecurity among the Chamorros and gave rise to the desire to return to the Marianas. A group of 304 left in February of 1946, migrating to Saipan, where they were attracted by the high wage scale. Others followed, family by family, as transportation was available. The remaining group, numbering 217 persons, left Yap in April of 1947 to settle on Tinian.

The move was accomplished by the Navy, which provided transportation for the people, their personal possessions and livestock and gave assistance in establishing the people in their new homes. On arrival at Tinian, the migrants first occupied the former Okinawan fishing base, established during the internment period, while the village site at the former Civil Administration Headquarters was being cleared and the buildings repaired for occupancy. (Fig. 45). Space was abundant and each quonset or military building was occupied by only one family. Arrangement of families within the village area was by kinship and friendship groups. The main portion of the village is within a road-enclosed square throughout which paths give access from one building to another. One of the buildings was set aside as an administrative office, and a former military chapel gave space for religious services. Water and medical facilities were provided through the Army, which then had a small group on the island. Level land of good fertility surrounds the village, and selection of farm sites and clearing of fields began as soon as the village was in order. Named San Jose in honor of the patron saint for April, the month of settlement, the village soon attracted settlers from Saipan, particularly from among the Chamorro group which had first left Yap. These people occupied a portion of the former Japanese internment camp immediately northwest of the village until permanent home structures could be provided. Population of the entire settlement as of June 30, 1949 was 354.

Regional Transportation

The binding of all the settlements together into a coordinated frame by transportation has not yet been fully accomplished. The entire problem of resettlement on an economic basis above the subsistence level is dependent to a large degree upon the establishment of scheduled inter-island and inter-Pacific transportation. This is a problem that turns in a circle. Privately

¹ 'Chamorro Natives Leave Yap Homeland,' *Guam News* Vol. IV, No. 102, April 11, 1948, p. 8.

owned vessels cannot profitably stop at the islands until pay loads increase, and greater production awaits the surity of dependable shipping. The Japanese reached a solution by subsidy. Prior to the war, the Japanese mandated area was served by four lines, one of which was specifically established to operate in the Marianas, and the others stopped at the islands enroute to and from the Carolines and Marshalls. Subsidies from the South Seas Government Bureau totalled 700,000 yen (\$201,530)¹ annually between 1922 and 1937. Later this amount was increased; the 1940-1941 budget showed a grant of 780,000 yen (\$182,832).² Vessels of these four lines docked 108 times a year at Saipan, and a fewer number of times at Tinian and Rota. In addition, ships which received no government aid stopped several times a year, and inter-island traffic was maintained by local vessels.

At present, transportation in the district is maintained by both the Navy and private shipping interests. All traffic between Saipan and the occupied islands to the north, including the Bonins which are administered from Saipan as a military district, is maintained by the Navy, either with the Civil Administration station ship based on Saipan or with vessels made available by other branches of naval service on the islands. South of Saipan, naval service for commercial transport was discontinued in July of 1947, when private shipping was inaugurated between Saipan, Tinian, Rota and Guam. Since these four islands are served by private ships, the Island Trading Company of Micronesia, a government organization which buys, sells, and transports goods in the Trust Territory for the benefit of the native inhabitants, does not function in the Northern Marianas.³ In addition to the handling of trade goods to and from the northern islands, Civil Administration is concerned with providing transportation for government officials, doctors, nurses, teachers, priests, missionaries and scientific workers; the transport of people and their possessions for resettlement; the shipping of supplies and equipment needed for rehabilitation; and the movement of the sick requiring hospitalization to Saipan.

¹Based on the yen exchange rate for 1937.

²The yen exchange rate decreased from \$.4985 per dollar in 1930 to \$.2344 in 1940.

³'The Island Trading Company of Micronesia was organized in response to the Reconstruction Finance Corporation's request that the Navy take over the United States Commercial Company's functions in the Trust Territory. Its entire capital stock is owned by the Deputy High Commissioner in his official capacity. All its dividends go into the Trust Territory Treasury. The Navy has provided the company with free transportation in navy vessels, when available, both for trade goods coming into the territory and for island products going out; has paid Island Trading Company American personnel, provided stevedoring at Civil Administration centers and also provided land and water transportation for Island Trading Company personnel.' U.S. Navy Department, *Information on the Trust Territory transmitted to United Nations, 1948*, p. 29. The organization of the company is an interim arrangement until such time as the inhabitants of the various localities are in a position to conduct commerce and transportation on their own account.

Private inter-island shipping between Saipan and Guam and the intervening islands is maintained by two Guamanian companies, each of which operates a single ship. Carrying charges between the islands and Guam are \$1.60 per weight or measured ton, exclusive of stevedoring, which adds five or six dollars more to the total cost. Extra charges are added at Rota because of the need for lighter service. Passenger tickets, one way, between Saipan and Guam are \$7.50. Food and sleeping quarters are not available aboard ship. Neither line maintains a regular schedule, and the ships usually do not stop at Tinian or Rota unless goods or passengers are to be unloaded. As a result, persons expecting to depart are sometimes stranded and spoilage of fresh produce ready for shipment is high. The Tinian Produce Company reported losses as high as two thirds of a vegetable crop due to lack or lateness of shipping. Rota had irregular contact with Guam about once every ten or twelve days by a small ship which picked up fruits and vegetables. Since arrival time was unknown, it was necessary for the ship to remain anchored in the harbor while the Rotanese farmers visited their farms to gather produce.

Increased cooperation on the part of the present Guamanian lines and the encouragement of local shipping would do much to further economic development within the Saipan District. The companies now operating between Saipan and Guam should be required to stop at Rota and Tinian, at least on signal, and to maintain as regular schedules as the weather will permit. In order to enable the local farmers to move their produce to Guam when harvested, it might be possible to organize a shipping association for Saipan and Tinian and another for Rota. Such an organization was functioning on Rota in 1947, attempting the repair of a salvage landing craft which would have enabled them to make trips to Guam as needed. The work was never completed, however, after the vessel was damaged by a typhoon in November 1948.

Shipping from the Northern Marianas makes contact with trans-Pacific lines at Apra Harbor, Guam, a center for trans-shipment in the Trust Territory. Freight is deposited here, stored, and picked up by private lines and the Island Trading Company in the processes of collection and distribution. Importing for the Saipan District is handled largely by Saipan Importers, a native group with headquarters in Chalan Kanoa. The few exports, mainly copra and trochus shell, are shipped on private lines under the supervision of Civil Administration, and are then shipped and sold by the Island Trading Company. Charges to San Francisco are \$30.40 per weight or measurement ton.

No commercial airline serves the Northern Marianas. One scheduled flight a week is made between Guam and Saipan by Military Air Transport Service (MATs), and unscheduled air flights are flown as needed. Passenger traffic consists primarily of military and civilian personnel and dependents. At Guam, connections can be made with trans-Pacific air routes both commercial and military. The present frequency of scheduled air services in the Northern Marianas is about equal to that of the Japanese period prior to 1942. Connections were then available from Yokohama via Saipan to Palau, with flights one way each week, and from Tinian to Palau twice monthly.

Consideration of transportation to and from the Saipan District focuses attention on a major problem involved in the successful occupancy of the area on a firm economic basis. The transshipment of goods through Apra Harbor, Guam, results in extra stevedoring expense which must be added to the price

of any commercial products sold from the area. To this must also be added the shipping costs over long routes to market (Table 9). In addition to the problem resulting from the influence of long distances on the position of the Marianas in the competitive market, there is also the problem of how regular transportation is to be provided to carry whatever goods are produced; not only in regard to the Saipan District but for all the scattered island areas in the Trust Territory off main routes. The venture is not an attractive one to commercial enterprise. While the Trust Territory expenditures for transportation in the fiscal year of 1948 were \$26,190.90,¹ this figure does not compare with actual costs as they would be encountered by private enterprise in giving the same service, because of capital investment in ships and increased expenses for labor and maintenance. The difference is expressed in the rate of \$0.0075 per ton per sea mile charged by the Navy for freight carried between Guam and Civil Administration centers (except Saipan) and the commercial rate of \$0.0152 per ton per sea mile between Guam and Saipan.² Nor do the expenditures as listed by the Navy represent the total cost of all services rendered since, through the coordination of ship movements performed by various naval branches, it has been possible to give many of the islands transportation contacts which are not included in the expenditures as listed by Civil Administration.

It is questionable whether private interests can operate scheduled lines without subsidy, at least until the islands are brought to a higher productivity. In the 1937-38 fiscal year, the total amount of exports from the Japanese mandated area was \$22,335,860.10 (77,582,008 yen) or about \$387.38 per capita; the total imports were \$13,509,183.52 (46,923,180 yen) or \$184.40 per capita.³ In the same year, the subsidy to shipping was \$201,550.00 (700,000 yen). Unfortunately data are not available to indicate the ratio between the operating costs of Japanese shipping and the subsidy. The total value of trade, however, for the given year was the result of twenty-four years of intensive, directed, commercial effort and is in striking contrast to the present commerce and the pay loads available for pick-up from the same area. For the year from July 1, 1947 to June 30, 1948, the total exports from the Trust Territory amounted to \$894,508.94 or about \$17.37 per capita and the total imports to \$731,870.01 or about \$14.21 per capita.⁴

During the spring of 1950, the Department of the Interior, the Island Government Unit of the Navy Department, and representatives of several Pacific

¹U.S. Navy Department, *Information on the Trust Territory to the United Nations*, p. 85.

²If freight were carried between Guam and Saipan at Naval rates, the total charge would be \$0.737 per ton instead of \$1.60 per ton.

³U. S. Navy Department, *Information on the Trust Territory to the United Nations*, p. 85.

⁴Basic data on trade from U. S. Navy Department, *Information on the Trust Territory to the United Nations*, p. 88.

TABLE IX
SAILING DISTANCES FROM APRA HARBOR, GUAM, TO PACIFIC PORTS

Garapan, Saipan.....	121
Yokohama, Japan.....	1,353
Shanghai, China.....	1,687
Hongkong, China.....	1,822
Manila, Philippines.....	1,506
Rabaul, New Britain.....	1,320
Sydney, Australia.....	3,067
Honolulu, Hawaii.....	3,337
Panama, Canal Zone.....	7,988
Los Angeles, United States.....	5,567
San Francisco, United States.....	5,055

steamship and air lines made a survey of transportation in the Trust Territory in order to formulate plans for the transition from naval to commercial transportation when the Department of the Interior assumes administrative control of the area on July 1, 1951. As a result of the survey, a report was submitted to President Truman recommending that private transportation services be established for the Trust Territory. Guam was proposed as one of the Pacific collection and distribution centers, with connections to the United States and foreign ports based on cargo service every four weeks. Contracts were to be awarded regardless of the nationality of the bidder or the flag of operation. In case the bids received were higher than the cost of naval operation, the group recommended that the government undertake operation, using vessels transferred by the navy. It was also suggested that five navy vessels of the auxiliary cargo type be transferred to the Trust Territory Government for use as station vessels for official travel and to supplement local shipping. In addition to these vessels, it was especially urged that locally owned and operated shipping be encouraged for inter-island transportation.¹

¹'Transportation Savings Seen in Transfer of Trust Territories,' *Honolulu Star Bulletin*, May 30, 1950, p. 20.

Agriculture and Associated Problems

The place of agriculture in reconstruction is basic, utilizing the area's primary resource, the soil, and the population's traditional occupation, the cultivation of the land. Agriculture has been the foundation of economic life in the islands since the time of prehistoric settlement. Beginning in the late Spanish period, the Marianas began to be drawn slowly into commercial agricultural production. This trend was accelerated by the Japanese, who converted the Northern Marianas into highly productive areas, farmed by colonists who produced a surplus for sale within the Empire. Few of the natives were caught up wholly into the socio-economic system established by the Japanese; in the entire Saipan District only thirty-eight native families cultivated cane for the sugar factories,¹ the greater number preferring to sell their labor and to rent their land, retaining only enough to provide food for home use. In spite of the efforts of both the Germans and the Japanese to improve native farming methods, old practices, dating mainly from the Spanish period, remained dominant, as did also the traditional subsistence attitude toward the land.² Much change and time will be needed to raise local farming to a commercial basis which will support the level of government and the standard of living desired by the people.

Agricultural Rehabilitation

The effect of the war on agriculture was one of total disruption, displacing the farmers from the land, and making complete rehabilitation necessary. The reestablishment of farming on Saipan and Tinian following the American assault was hurried by the necessity of placing the population on a subsistence basis as soon as possible, thus assuring a food supply, avoiding unnecessary expense, and releasing valuable cargo space for military imports. Many of the agricultural problems which arose at the time could not be solved at the moment under the pressure of the situation. The work of civilian food production was co-ordinated with that of the Foreign Economic Administration (F.E.A.), then producing fresh fruits and vegetables in the Pacific area to meet the needs of military consumption. Wherever possible, F.E.A. machinery was used in cultivating fields for both military and civilian food supply, and laborers were assigned by the economic officer of Military Government to assist in production. Other camp internees added to civilian production by farming in controlled areas, each group--Korean, Okinawan, Japanese, or native--following characteristic methods according to nationality. After the end of the war, F.E.A. operations were gradually suspended and cultivation for the military was assumed by U.S.C.C.

¹Yanaihara, *Pacific Islands Under Japanese Mandate*, p. 61.

²The same generalization applies to agriculture among the Chamorros of Guam. Considering that the Americans have been in possession of the island since 1899, little change has been effected in native farming methods.

Following repatriation of the Japanese nationals in 1946, it was necessary to reorganize agriculture on Saipan.¹ Beginning in 1945, however, a few Chamorros and Carolinians had been released month by month by the Labor Office of Military Government to return to farming. While demand for labor was still high at American military installations, nevertheless, by March, 1946, it was possible for U.S.C.C. to terminate all large-scale operations and to transfer responsibility for food production to two native farm associations. Composed of 106 members, these two groups cultivated 365 acres of land, utilizing U.S.C.C. equipment in common, but with each member farming individual plots from two and one-half to three acres in extent. These plots were contiguous, occupying former F.E.A. and U.S.C.C. farm areas on the southern plateau near the present village of Aslito and on the coastal lowland northeast of the village of Uleai. Aid and direction was given the farmers in planting, cultivating, the building of small 'noon-time' houses, and marketing. Meanwhile, side by side with this commercial development, other native farmers were bringing their own or assigned plots into production. By January 1, 1947, agricultural reconstruction had reached a point which made it possible to discontinue the gratuitous issue of food and supplies to the native populace. Unfortunately, at the same time, heavy purchases of farm produce ceased because of the withdrawal of most of the American military personnel; but retail outlets were opened at the army and navy commissaries and in the village of Chalan Kanoa. Further disruption of the farm program occurred in March of 1947, when a directive was issued by the Trust Territory government requiring that all privately owned land not occupied by the military should be returned to native ownership. This necessitated movement of nearly all farm association members and the breaking up of the common farming areas, as well as the shifting of a few natives not holding membership in the organization. Transfer was slow due to lack of transportation, the movement of animals, and the dismantling and reconstruction of farm buildings. U.S.C.C. was liquidated in November, 1947, shortly after the farm move was effected. The association members, who had fused into a single group, continued to function until late 1948, when disbandment occurred from lack of cooperation among the members. At present, all farms on Saipan are operated on a private and individual basis, primarily for subsistence food production, as is also the case on Rota and among the colonists on Tinian. An agricultural experiment farm established in 1948 on Saipan serves the farmers in many ways. Weekly markets for the sale of farm produce are held in Chalan Kanoa, monthly meetings are conducted for farmers, 4-H Clubs are directed for boys and girls, and numerous settings of cacao, coconuts, papayas and betel nuts have been distributed for planting. The farm is under the direction of the economics officer of Civil Administration and a native agricultural agent trained at the University of Hawaii.

Production since the rehabilitation of the native farmers shows a striking contrast with that of the prewar period and gives some indication of the extent of the problem facing American administration if the former productivity of the area is to be restored (Table 10). As of August, 1948,

¹Reorganization was not necessary on Tinian or Rota. The natives of Rota had had access to their farms throughout the entire period of the war, while Tinian had no native inhabitants.

TABLE 10
PREWAR AND POSTWAR AGRICULTURAL PRODUCTION, SAIPAN DISTRICT

CROPS	ACRES	TONS	VALUE
A. 1937: ^a			
Vegetables:			
Millet.....	4.94	1.32	\$ 34.54
Corn.....	321.23	72.20	2,344.99
Soy Beans.....	22.24	4.08	224.77
Peas.....	51.89	9.92	535.31
Beans.....	64.25	15.54	717.49
Sweet Potatoes.....	778.37	909.62	12,508.65
Yams.....	86.49	115.52	928.16
Taro.....	150.73	475.53	6,514.64
Watermelon.....	289.11	1,041.34	16,646.35
Pumpkins.....	469.49	2,946.45	8,904.53
Cucumbers.....	88.95	464.40	5,379.56
Casaba Melons.....	51.89	78.04	643.23
Muskmelons.....	93.90	224.54	7,036.71
Eggplant.....	39.54	150.91	3,425.97
Daikon.....	61.78	229.28	2,519.11
Busei.....	7.41	21.50	287.22
Carrots.....	4.94	2.09	28.78
Burdock.....	4.94	14.99	175.27
Ginger.....	9.88	48.50	862.54
Onions.....	81.54	103.40	3,645.27
Other Vegetables.....	118.61	890.44	3,918.97
Fruits:			
Mangoes.....	9.88	1.65	716.05
Pineapples.....	34.59	20.50	348.53
Bananas.....	192.74	226.63	992.91
Mandarin Oranges.....	24.71	13.56	272.55
Papayas.....	941.45	137.35	23,314.68
Commercial Crops:			
Tobacco.....	9.88	1.65	716.05
Cotton.....	247.10	31.86	2,038.20
Sesame.....	2.47	.99	101.88
Castor Beans.....	106.25	3.75	495.59
Coffee.....	491.73	290.24	5,077.94
Cacao.....	24.71	.22	110.23
Sugar Cane.....	28,354.73	578,769.78	664,656.54
Tapioca.....	3,615.07	12,575.59	39,390.03
Copra.....	7,084.36	606.26	41,159.72
Total	43,941.79	600,499.64	\$856,672.96
B. 1948: ^b			
Total	1,477.95	147.62	\$ 14,157.85

^aConverted from Japanese data on agricultural production, as given in U.S. Navy Department, *Mandated Marianas Islands*, p. 139.

^bStatistics by crops not available. Figures for acreage were tabulated from data collected in the field by the writer; those for total tons and total value were tabulated from 1948 Quarterly Reports of the Civil Administrator, Saipan District.

1,477.95 acres were reported under cultivation¹ as compared with 43,941.79 acres in production in 1937.² Due to different methods of compilation, the available figures for the total value of farm produce for the two periods are not comparable; nevertheless the statistics can be presented to give some measure of the situation. The value of commercial produce from the native farmers in 1948 was \$14,158.86³ while the total value of all farm produce in 1937 was \$856,672.96.⁴

As part of the agricultural program on Saipan and Tinian, U.S.C.C. assumed responsibility for the livestock corralled by Military Government after the end of hostilities on the islands. Because of the need for food, it was at first necessary to slaughter some of the animals, but this procedure was terminated as soon as possible in order to provide a breeding core for restocking the islands. Farmers were permitted loan of the cattle for draft purposes and possession of any animal for which ownership could be proven. On Saipan all the cattle which remained unclaimed up to October, 1946, were sold at established prices, chiefly to farmers who had land under cultivation. The closing of the cattle pool accentuated the shortage of draft animals; the value of a mature cow rose from thirty-five dollars to over three hundred dollars,⁵ and persons returning to farming were unable to obtain an animal. At the time of the cattle sale, U.S.C.C. also disposed of all hogs in its possession. This terminated the work of the organization with animals on Saipan, goats and chickens having been released to the farmers at an earlier date. Most of the cattle and hogs captured on Tinian were shipped to the Carolines and the Bonins, although a few were sent to Rota. The prewar and postwar figures for animal population in the Saipan District are as striking as those for agriculture (Table 11).

Native Farming Practices

The usual native farm gives a first impression of haphazard planting, careless cultivation, and low productivity. Adding to the chaotic appearance

¹Tabulated from a farm census taken in the area during the course of field work. This figure can be taken only as an approximation, for many native farmers were uncertain about the extent of their cultivation.

²Converted from Japanese data on agricultural production as given by U.S. Navy Department, *Mandated Marianas Islands*, p. 139.

³Summarized from 1948 Quarterly Reports of the Civil Administrator, Saipan District.

⁴Converted from Japanese data as given by U.S. Navy Department, *Mandated Marianas Islands*, p. 139.

⁵Price control has since been enacted; a mature cow is now priced between \$125.00 and \$150.00.

TABLE 11

POSTWAR AND PREWAR LIVESTOCK NUMBERS IN THE SAIPAN DISTRICT

	1948 ^a	1936 ^b
Cattle.....	382	4,845
Pigs.....	890	6,848
Goats.....	87	862
Water Buffalo.....	0	38
Horses.....	1	44
Sheep.....	0	0
Chickens.....	4,099	54,486
Ducks.....	7	5,676
Turkeys.....	0	24
Geese.....	0	9

^aBased on a farm census taken during the course of field work.

^bJapanese Government, *Descriptive Outline of Saipan*, p. 46.

may be destroyed buildings, shelters hastily constructed of salvaged materials, and fields and groves invaded by weeds, as most farmers have not yet been able to bring their lands back into normal production. Despite first appearances, however, native cultivation is well adapted to environment, and highly productive in relation to inherited techniques and the traditional function of the land in native economy. Extent of planting is based primarily on family need and is planned to provide as continuous a harvest as possible within the limitations set by the seasons.

Although a farming people, the Chamorros and Carolinians are not farm dwellers, but visit their holdings as labor is required or produce needed at home. At such times, the farmhouse provides shelter for nooning and against rains, and a place for sleeping in case the farmer and perhaps his family decides to remain on the *rancho* overnight or for two or three days. The

building is normally less well built than the village home but is of the same general type, set on piles and constructed with a detached or semi-detached cookhouse (Figs. 56 and 57). No barns are needed as cattle are tethered. Surrounding the farm house, often planted almost up to the door, is a complex and varied story culture of interplanted fruits and vegetables (Figs. 58 and 59). Between the trees or, if the shade is very heavy, in small open plots, is a variety of vegetables and fruits which add to the daily diet--pineapples, taro, melons, beans, peppers, eggplant, and cucumbers. Farther from the house are larger areas of corn, sweet potatoes, and pineapples. In addition to the trees planted in the dooryard--bananas, papayas, mangoes, coconuts, citrus, and avocado--others, including breadfruit, are planted throughout the farm area. If the family is entirely dependent upon farm income and a market is available, larger plantings of salable produce are included in the farm pattern. Cultivation is by garden-like, hand methods adapted to small plots.

Farming is a family enterprise. Husband, wife, and children work on the *rancho* with a division of labor according to age and sex. The main burden of the labor falls upon the father, who initiates and directs activities; he and his sons spend a larger proportion of their time on the farms than the women, who have household duties to perform in the village. Heavy work such as clearing and plowing falls to the men. Frequently, assistance is given by relatives, following patrilineal lines and based on reciprocal exchange. Planting, weeding, and harvesting are accomplished with the help of the immediate family. If the father is employed as a wage earner, this work falls almost entirely to the other members of the family; under such circumstances, the farm is usually not fully cultivated unless the family includes older boys.

Trips to the *rancho* are made three or four times a week. Unless livestock numbers are large, farm animals do not receive daily attention. Pigs and chickens can be left to roam, and the cow is used as a draft animal when the farmer returns to the village. Travel to the *rancho* is by foot, ox cart, or, in some cases, principally on Saipan, by truck or jeep. There is a certain pride in the length of the day spent on the farm; farmers often leave the village as soon as possible after five o'clock mass and are 'ashamed' to return home early in the afternoon. Many farmers report that they now spend less time on their land than in the Japanese period, when many depended upon the narrow-gauge sugar cane railway for transportation and walked whatever distance remained. While such riding was illegal, rulings were not strictly enforced, and the island farmers took full advantage of the situation.

Much of the farmer's energy output is in the form of hand labor. The chief farm tools are the *machete* and the *fosino*, both of which were introduced in the Spanish period. The *machete* is worn almost constantly by the farmer as he goes about his tasks. Carried in sheath and fastened to his belt, it can be easily drawn for any cutting job--opening coconuts, harvesting bananas, cutting grass and brush, and splitting wood. Its major use, however, is in clearing. The *fosino* is a shuffle hoe with a flat, straight-edged blade attached to an eight- or ten-foot handle (Fig. 60). As handled by the natives, it proves an efficient tool, and is much preferred to the hoe for breaking soil, planting, weeding, clearing, and cultivating. Other tools known and used occasionally are the mattock, grub hoe, sickle, shovel, and rake. Among the tools introduced by the Japanese, the *kama* and the *kua* are the most



FIG. 56. Farmhouse. Constructed of salvaged materials. Cookhouse to left of dwelling.



FIG. 57. Saipan: Farmhouse.

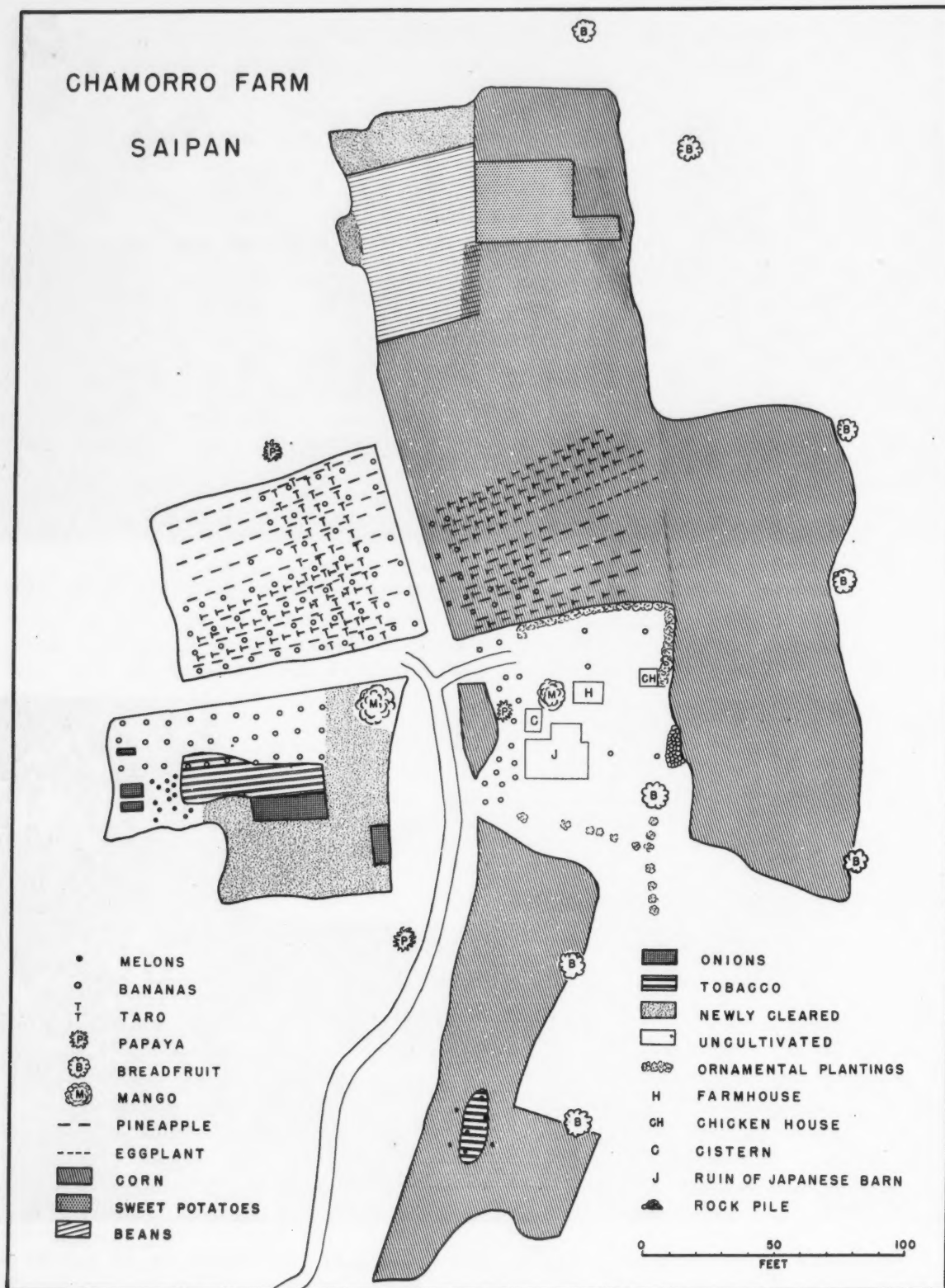


FIG. 58



FIG. 59. Saipan: Chamorro farmstead. Interplanted field in foreground--pineapple, taro, and corn.



FIG. 60. Setting sweet potato plants.

popular. The *kama* is a sickle-like tool, sharpened on both sides of the blade and used in weeding and clearing; sometimes it is attached to a pole and utilized in cutting down coconuts and breadfruit (Fig. 61). The *kua*, a heavy, long-bladed hoe, is utilized to mound the earth for sweet potato hills or for preparing the soil instead of plowing. It enables the farmer to accomplish more in a shorter time than with the *fosino*, but its use is back-breaking because of the short handle. Iron-tipped plows pulled by cattle are used in turning the soil, cutting a furrow about four or five inches deep. Often the farmer's weight is needed to keep the plow in the ground.

Clearing land for cultivation is a laborious task to which farmers must now apply a great deal of time in order to recover abandoned fields. Most clearing is done with the *machete*, as the growth to be removed is generally scrubby and bush-like in character. Trees too large for removal are killed by burning (Fig. 62). Grass and the smaller roots are removed with the *fosino* and the grub hoe, and the clearing process terminates with the piling and burning of all vegetative waste.

The seasonal distribution of rainfall is the major planting control. Planting takes place in late April, May, or early June so that the crop can be harvested before the heaviest rainfall comes, and again in late September or early October before the rains fully decline (Table 12). Planting schedules are less rigid on the windward and more humid eastern coasts, on higher elevations, as the slopes of Mount Tapotchau, and in the deeper lowland depressions. The dry season is of sufficient intensity to retard plant growth and sometimes extreme drought occurs. During the dry period, water for cattle becomes a problem on the upland.

Farm Production

Corn.--Corn is a major crop, occupying over 50 per cent of the cultivated area. Introduced by passing Spanish ships shortly after the islands were discovered, it quickly became popular as a food and reduced the consumption of ~~other~~ local items in the diet. Reflecting its importation from Mexico, the grain is most popularly used for *tateyas* (*tortillas*), sometimes with an admixture of coconut. Corn is also boiled or roasted on the cob or cut from the ear and boiled with coconut milk. In addition, it has a limited use as feed for chickens and pigs. The type grown is a hardy, white, semi-dent, field variety producing about twenty bushels per acre. In preparation for planting, the soil is broken either with the plow or the *fosino*. Seed holes, arranged in rows from two and one-half to three feet apart, are dug with the *fosino*, and three to five kernels are dropped in each hole. Rats are a constant menace, digging out the seeds and making some replanting necessary. After the ears are set, the tassels are sometimes broken from the stalk, as this is believed to reduce insect attacks. Also, most of the natives break the stalk just below the ear after the grain partially hardens, leaving the ear hanging downward to hasten maturity and to prevent water from collecting inside the husk. The corn is harvested by picking in the field, first by selection as the ears ripen, and then by complete gathering; the stalks are left standing until the next planting, when they are cut and scattered over the surface to decay. All corn is gathered and shelled before completely dry, and one of the commonplace village scenes is that of the farmer's wife raking the corn as it lies spread in the sunlight. This procedure must be repeated once every two to three weeks to prevent molding and



FIG. 61. Chamorro girl with a *kama*. This tool is used in weeding.



FIG. 62. Newly cleared land. Plantings will be made between the stumps and remaining trees.

TABLE 12
CALENDAR OF FARM ACTIVITIES^a

Month	Average Temp. ^b	Average Precip. ^b	Farm Activities
Jan.	76.4	2.6	Weeding, clearing.
Feb.	76.0	3.6	Clear land, weed fields, plant corn in mountain areas, harvest corn and sweet potatoes planted in October, mango picking begins.
Mar.	77.0	3.8	Clear land, prepare soil with <i>fosino</i> or plow, harvest tobacco, pineapple season begins.
April	78.2	2.8	Prepare soil for planting with <i>fosino</i> or plow, plant corn, sweet potatoes, taro, yams and gardens with first heavy shower, plant coconuts and bananas, avocados ripen.
May	79.1	3.7	Plant fruit trees, corn, sweet potatoes, harvest corn planted in February, height of sweet potato harvest, make gardens.
June	79.9	5.1	Plant papayas, plant beans and vegetables, weed fields.
July	79.1	10.0	Weeding, pineapple season ends, begin picking corn planted in April, mango season ends.
Aug.	79.4	13.1	Weeding, plant tobacco in seed boxes, pick corn, avocado season ends.
Sept.	79.0	13.3	Clear land for second planting, burn weeds, prepare soil with <i>fosino</i> or plow, transplant tobacco.
Oct.	79.1	11.4	Plant corn, sweet potatoes, beans, vegetables, melons.
Nov.	78.8	7.4	Plant sweet potatoes, weeding.
Dec.	77.8	5.4	Weeding.

^aBased primarily on information supplied ^{by} Mr. Ignacio Benevente, Agricultural Agent, Saipan. The months as given are only approximate due to annual variation in the rainy season.

^bTemperature and precipitation statistics for Garapan, Saipan, U. S. Weather Bureau. Temperatures represent an average over a six-year period; precipitation an average over a nineteen-year period.

infestation by weevils (Fig. 63). Some consideration is given to the selection of seed by setting apart the larger and better filled ears.

Sweet potatoes.--Sweet potatoes, more important as a crop among the Carolinians than the Chamorros, have been introduced in numerous variety since Spanish discovery of the islands, but three types are now dominant in native plantings. *Sango* is the most popular, maturing quickly and producing many tubers. *Kakungo* has large tubers but is less sweet in flavor. *Comote Amari-go*, introduced from Guam by the Germans and distinguishable when growing by the yellow coloring of the leaves, matures less rapidly and produces fewer potatoes than the other two varieties. Sweet potatoes are grown from cuttings and are commonly planted in hills or ridges from eight to twelve inches high and arranged in rows from two to three feet apart (Fig. 64). Sandy loam gives the best crop, producing up to an estimated five thousand pounds per acre. In planting, two or three cuttings, each from six to seven inches in length, are thrust into holes at the top of the hill or ridge and pressed into the soil. A few farmers plant 'Japanese fashion,' laying ten- to twelve-inch cuttings horizontally in shallow trenches dug on the surface and covering the stem until only the leaves protrude. Most farmers prefer to plant in hills or ridges since this facilitates harvesting, but it also increases the possibilities of rat and drought damage. Plantings can be made at any time of the year but are generally coordinated with the rainy season. Some attention is paid to the quality of the cuttings by selection from the most vigorous vines. Potato digging for daily supply begins as soon as the tubers are big enough to eat. Digging into the hill does not disturb the plant. Theoretically a field, if kept free from weeds, should remain in production year after year, but infestation by weevils, which bore through the tubers, makes necessary the planting of new fields every six to twelve months. Sweet potatoes are one of the islands' emergency foods, since they generally escape damage by typhoons.

Taro.--Nearly all farmers raise taro, although as a food it is more popular among the Carolinians than the Chamorros. It is used either boiled or stewed and is sometimes pulped with coconut and sugar, but it is never fermented as *poi* in the Hawaiian manner. Taro is planted from rootstalks or from portions of the stem cut from just above the root. Three varieties are in common use. *Suni Honolulu* (Hawaiian taro), characterized by pointed lobes and prominent sinus extending to the piko, produces large white-meated corms marked with brown and purple fibers. On good soil it grows to a height of about five feet. Growing about two feet high, *Suni Hapon* (Japanese taro) has a somewhat darker stem than *Suni Honolulu* and smaller but more numerous tubers. *Suni Bisaba* (Philippine taro), distinguishable by the purple-red coloring of the piko and stem, is much preferred as food to the other two. While planted on upland soils as the others, it is also grown in lowland depressions and along the banks of permanent and intermittent streams. Any lowland soil which supports the marsh grass *Karriso* (*Phragmites karka*) is regarded as best for its production.

Yams.--Planted in April and harvested from October to December after the leaves begin to die, yams are produced in limited quantity and used in the same manner as taro. The root stock is perennial. Propagation is by root cuttings, each containing one or two buds. Plantings are made in hills around the base of trees, and long poles are set against the trunks for the climbing vines. Beyond weeding, no attention is given to the growing plants.

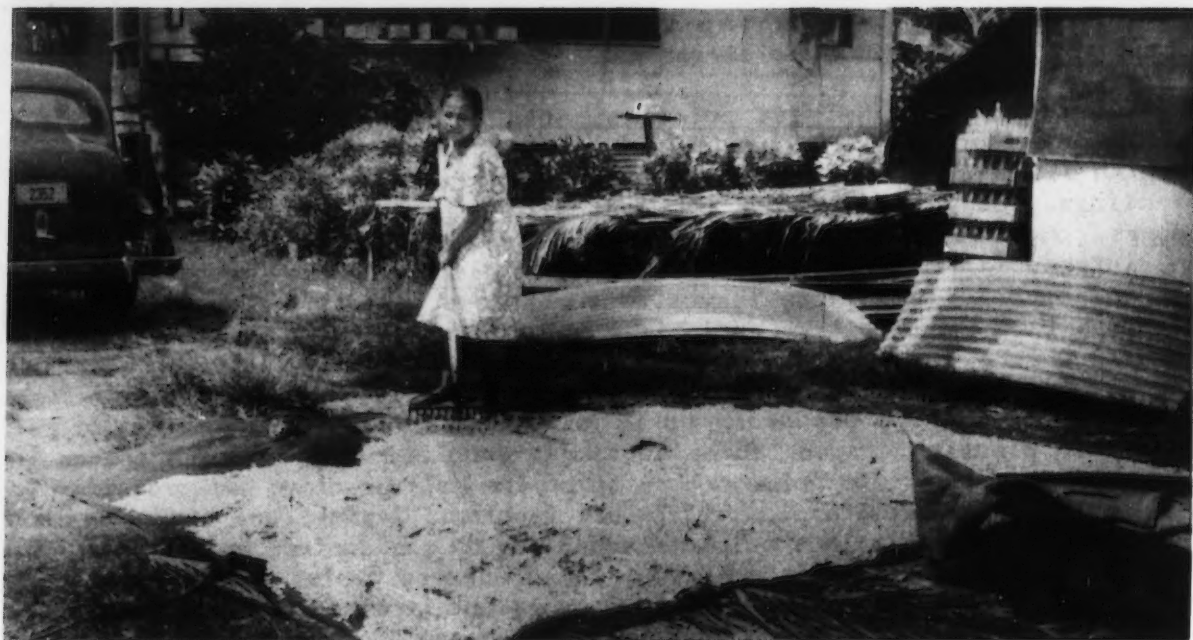


FIG. 63. Drying corn. This procedure must be repeated every two to three weeks to prevent molding and infestation by weevils.



FIG. 64. Newly planted field of sweet potatoes.

After the harvest, the yams are stored in the house and require occasional sorting to remove those which have started to decay. No plantings were observed in open gardens with set poles, as is common in some tropical areas. Yams, like sweet potatoes, are useful as emergency food, when typhoons may have destroyed standing crops.

Tobacco.--Tobacco is grown by a few of the farmers for making cigars. When dried, the leaves are wrapped into crude cigar-shape and bound with thread or a banana fiber. No filler is used. Tobacco is grown only on rocky upland areas, the sandy lowland soils producing a leaf of strong, undesired flavor. In planting, seeds are sprouted in boxes in September and transplanted in October and November. Prior to the war, a few of the natives produced tobacco for the small Japanese shops in the villages which made cigars for local trade.

Vegetables.--The wide variety of vegetables grown is the result of numerous introductions made during the long period of foreign domination. Less restricted environmentally than the low islands, the Marianas offered favorable conditions for many new plants, but little scientific attention was given to introductions until the Germans gained control of the islands. The most common vegetables, however, are those introduced from Mexico and the Philippines early in Spanish times and now well incorporated into the local diet. These include beans, eggplant, peppers, onions, melons, squashes, and cucumbers. Beans, grown in wide variety from ground to climbing types, with careful planting will provide an almost continuous supply throughout the year (Fig. 65). All types of soil are used for their growth. Most of the beans are picked and used before they reach maturity. Eggplant is well adapted to the area, growing with very little care; it is not particular as to soils, is resistant to drought, but requires attention as to drainage; otherwise the fruit drops during the rainy season. Peppers, large sweet varieties to small hot types, are a favorite among the islanders. They are grown both on the farm and around the village home. Peppers are usually planted in seed boxes and then transplanted when the sprouts are about six inches high. Attention is given to shade and watering if the plants are set during the dry season. Onions are grown either by planting seeds in the garden or by transplanting sprouts from seed boxes. They require from eighty to one hundred days to mature and are much appreciated as a food item. Cucumbers are prepared in many ways--boiled, baked, fried, or used in stews when ripe or in salads when green. Planted at the beginning of the rainy season, they bear abundantly in fifty to sixty days. Mildews frequently attack these plants as well as melons and squashes, causing the leaves to yellow and drop. All the vegetables grown from native seeds in the Marianas appear more resistant to drought than those grown from seeds imported from the United States or Hawaii. Quality, however, is not high as compared with that of American produce. Many of the islanders are interested in planting new vegetables which they have seen used by Americans and frequently request departing personnel to send them seeds. Usually these do not do well, failing either to germinate or to bear, due to climate, to planting at the wrong season, or to lack of proper care.

Coconuts.--Due to the ravages of the coconut beetle (*Brontispa mariana*), which began attacking the palms about 1931, and the clearing of trees for sugar planting, the coconut has disappeared entirely as a commercial crop on Saipan, Tinian, and Rota and has come to play only a minor part in native



FIG. 65. Field of beans. Beans are grown in wide variety in the Northern Marianas from ground to climbing types.

subsistence. About one-third of the few remaining trees are productive. The coconut is, however, a traditional and highly desired element in native agriculture, and the loss of the fruit is keenly felt by both Chamorros and Carolinians. Many uses of the palm dropped away as the culture was modified by foreign contacts, but its function as a major source of food continued until the depletion of the trees during the Japanese period. The fruit is eaten both green and ripe, the milk and oil are used in cooking, and the sap is utilized for making vinegar and an intoxicating toddy. Under the Germans, plantings were considerably extended and the Marianas presented the characteristic palm-fringed shores commonly associated with South Sea islands. On Saipan coconuts covered most of the eastern lowland and a large part of the southern plateau up to about 1933 (Fig. 41), but nearly all these were cut away, and the war took further toll. There are at present about 8,000 to 11,000 palms on Saipan, about two dozens on Tinian, and 250 on Rota.¹ The Chamorro settlers from Yap brought coconuts with them for planting on Tinian, and Civil Administration has made numerous trips to the northern islands, especially to Pagan, to obtain nuts for distribution to the farmers. The nuts are sprouted before planting and set about fifteen feet apart. Dependent on

¹Harry Lange, Jr., 'Report on the Control of the Mariana Coconut Beetle and the Giant African Snail,' U.S. Navy Department, Civil Administration Unit, Saipan, 'Quarterly Report, Oct. 1 - Dec. 31, 1947.'

soil conditions, the trees begin to bear in five to seven years and continue to produce for over fifty. Once set, the groves do not receive much attention, the growth between the palms being kept down by grazing or infrequent clearing. A wasp has now been introduced which it is hoped will control the beetle, and the farmers are planning to extend their plantings.

Copra production in the Saipan District in 1949 amounted to 254 tons as compared with 606.2 tons in 1937. The present production comes wholly from the islands north of Saipan. Since the war the market has been strong, and all copra produced in the Marianas has been readily sold. Within the Trust Territory, the U.S.C.C. and then the Island Trading Company of Micronesia set the purchase price of copra to protect producers from price fluctuation. Previous to February 1, 1948, first-grade copra was purchased at \$80.00 per ton; since that date the price has been \$100.00 a ton. The Island Trading Company hopes to be able to absorb all price fluctuations and to maintain this price for some time.

Betel nuts.--Very few farmers have producing betel nut (areca) palms on their farms. According to the islanders, the trees were once widespread in the wooded areas but were cut by the Japanese in clearing. Only an occasional tree is now seen. The betel nuts now used are imported from Guam. They are rolled in lime and chewed with the leaf of the piper betel vine.

Breadfruit.--Lemai, the seedless breadfruit, is extensively grown and serves as an important food, especially among the Carolinians. The fruit is baked, boiled, or sometimes French-fried; it can be preserved for future use by sun or oven drying or by storage in pits, as is practiced by some of the Carolinians. The seed-bearing variety of the breadfruit, known locally as *dogdog*, is seldom planted, although the seeds are sometimes eaten roasted. Breadfruit is also utilized as feed for pigs.

Bananas.--Bananas are a staple food crop grown on all the farms and sometimes around the village homes. Most farmers are familiar with from eight to ten varieties, including several cooking types. Plants are propagated from offsets removed from the parent tree and replanted in rows from seven to ten feet apart. New soil on well-drained slopes is preferred for planting, and often very rocky ground is cleared and brought into use (Fig. 66). No cover crop is grown between the trees. As soon as the fruit sets, the blossoms are clipped, thus conserving plant food and increasing the size of the fruit. The bananas mature in ten to fifteen months dependent on variety. The bunches are harvested when the fruit is plump but before any yellowing appears. Ripening is completed in the village home, either in the shade of the porch or in one of the rooms.

Other fruits.--Many of the fruits of the Marianas, like most of the vegetables, are the result of introduction within the historic period. The isolation of the islands made the importation of new plants, and even seeds, difficult, and most of the fruit is of low quality as compared with that produced in other tropical areas. Fruit is greatly appreciated in the diet, but supply has never met demand, and families with a wage-earning member have become accustomed to supplementing the farm supply with canned varieties. Most fruit trees are planted directly from seeds and, once sprouted, receive very little attention. Pruning and grafting are not practiced. It is customary to slash the bark of the tree trunk 'to make the tree produce better,' but



FIG. 66. Young banana grove. Note scattered coral fragments over surface of soil.

'smoking mangoes' to improve bearing qualities is not practiced, although the procedure is known by the natives through contacts with relatives in Guam. Mangoes, long cultivated on the islands, are a favorite fruit. Several varieties are grown and the fruits produced vary considerably in size, flavor, and fiber content. The trees require from ten to twenty years to come into bearing, and the crop per tree differs greatly in quantity from one year to another. Citrus is not extensively grown; each farmer may have one or two trees growing near the farmhouse. Small groves planted by the Japanese have become choked by invading vegetation. Oranges and grapefruit from the native trees are generally small with coarse pulp and thick rind. The lemons are of better quality. All farmers raise papaya, and some, through contacts with the Japanese, are familiar with papain production. The tree grows widespread, almost like a weed, and produces an abundance of fruit, generally of medium grade. Other fruits grown include sweetsop, soursop, avocado, *bilimbines* (*Averrhoa carambola*), *camachili* (*Pithecolobium dulce*), guava, and custard apple; the two latter have escaped cultivation and grow widespread.

Farm Animals

At the present time animals are of only minor importance in the farm pattern because of the depletion of stock during the war. As food supplies were cut off from Japan, slaughterings were increased to feed the military garrison. Other animals were killed during the American assault, and further slaughterings were needed to feed the civilian populace as soon as the people were brought together in camps. Some families are now entirely without animals and unable to make purchases because of the scarcity of stock. Meat,

used at least five or six times a week prior to the war, now appears in the diet only once or twice a month unless some member of the family is employed so that tinned or fresh products can be purchased. Native stock is commonly of inferior type and indeterminate character but hardy and well adapted to the area. All domestic stock except the pig and perhaps the chicken were first introduced from either Mexico or the Philippines and have since been mixed with breeds brought in by the Germans and the Japanese. Animals and poultry do not customarily receive systematic and careful attention; this, plus indiscriminate breeding, has resulted in low productivity.

Cattle.--Native cattle are small, varied in color, and light in weight. They are utilized chiefly for draft purposes and occasionally for riding and milking. Mature cows vary from 550 to 800 pounds and bulls from 600 to 1,000 pounds. Color markings and bodily features indicate admixture with Holstein, Guernsey, and Jersey, in addition to breeds introduced from Japan. Some of the cows are milked during the lactation period, which is short, seldom extending beyond the weaning of the calf. During this period the cows, which generally do not let down their milk except in the presence of the calf, are sometimes milked once or twice a day at irregular hours; they give from two to three quarts at each milking.

In customary Chamorro and Carolinian practice, the cattle are tethered, usually for the greater part of the day. The cattle are so tied that each animal can graze over an area within a radius of thirty to fifty feet. Watering is often neglected, and not much attention is given to shade. Salt is very seldom provided. The practice of castrating the larger and stronger bulls contributes to low productivity and inferior quality of stock, along with inadequate care and poor breeding.

Swine.--Swine, as in many peasant economies, are well adapted to the native farming system, producing a popular meat at small cost and effort. The native swine have been more improved by mixture with introduced stock than any other farm animal. Present hog types show dominant characteristics of Berkshire and Yorkshire, and some carry the Hampshire stripe. The swine are fed rations high in carbohydrates and, as a result, are overly fat by American standards. Boiled breadfruit and green papayas, taro, bananas, cassava, and garbage are the main foods supplied, with sometimes a little corn and fish refuse. When damaged flour and meal were available from army surplus stores, they were cooked with breadfruit and green papayas. An occasional farmer may build his pig pen directly under a breadfruit tree so that the fallen fruit is available to the animals, but this is regarded as a 'lazy man's' practice.

Goats.--Goats are probably the most hardy of all the domesticated animals but serve little use. They are permitted to range and often prove a nuisance around the farm. The animals are not milked but are used occasionally for meat, especially among the Carolinians. Most Chamorros regarded their possession of goats in a somewhat humorous light when inquiries were made in regard to the number and types of their farm animals. Children frequently play with the animals as pets, and are said to suckle the goats when hungry.

Other animals.--None of the natives now own a carabao, and only three reported possession prior to the war. Due to the general lack of standing water for drinking and wallowing, environmental conditions are not well suited

to the animals. Horses, like carabao, have never been important among the islanders. Only two natives reported ownership of horses prior to the war. These were used for riding and pulling carriages but not for work in the fields.

Poultry

Chickens.--The chickens seen on the farms are greatly mixed in breed. Coloring and bodily characteristics indicate mixtures of Rhode Island Red, Barred Plymouth Rock, Orphington, White Leghorn, and Cochin. The native hen is usually small, not much larger than a White Leghorn, and a poor layer. While some farmers reported that their hens laid a hundred or more eggs a year, observation indicates that the number is probably not more than forty or fifty. At times the chickens may be fed a little corn, a few beans, or table scraps, but for the most part they range for food. Shelter is seldom provided except for baby chicks, which are permitted to run with the mother but are sheltered on rainy days and over night.¹ Newly hatched chicks receive special feedings of rice and grated coconut, if available. If the farmer's *ranch*o is some distance from the village, small chicks may be kept at home until large enough to range. Since the farmer is absent from his land much of the time, rats, iguanas, and wild dogs and cats frequently attack the chickens, sometimes destroying the farmer's entire flock over a period of a few weeks. Because of the shortage of poultry on the islands, hens for breeding purposes may sell for as much as five dollars each and those for food at \$2.50 to \$3.00.² Most of the eggs are used for hatching instead of being served as food.

Other poultry.--Ducks, although raised in large numbers by the Japanese, are not popular among the natives, who regard the birds as being too unclean in their habits to have about the farm yard. None of the natives have geese or turkeys, although these, too, were raised on the islands by the Japanese.

Commercial Agriculture

Commercial agriculture is little developed, due to lack of a local market and inadequate transportation to possible points of sale. A few products--bananas, melons, cucumbers, and pineapples--move to Guam when shipping is available, but quantities are small and the income derived negligible as compared with potentialities (Table 10, Parts A and B).

Several commercial crops disappeared from production on the islands with the removal of the Japanese. Some of these had never been a part of the native crop pattern; others, such as sugar cane, rice, and tapioca, disappeared largely from native cultivation as commercial supplies became available on the market. Sugar cane was raised in small quantities by the natives into the

¹Two or three cases were noted in which the farmer had constructed a chicken ladder, so made that the fowl could fly from round to round and reach the lower branches of a tree for roosting.

²Mature chickens were sold at \$1.50 each when the U.S.C.C. disposed of their flocks.

early Japanese period; the stalks were crushed in small, primitive animal-powered mills and the liquid boiled to make a crude, dark sugar. Under the Japanese, cane became the major commercial crop produced in the area (Table 10 and Fig. 42). It still grows widespread, but is rapidly deteriorating for lack of attention. No use is made of the cane now either by the Chamorros or the Carolinians. Rice was also grown by the natives in the German period in the marsh around Lake Susupe on Saipan and in the volcanic area of Rota, where the streams provided an abundance of water for paddies. Writing in 1901, Fritz reported the dikes in the rice paddies of Rota to be of ancient date, but the natives were carelessly permitting them to fall into ruin, and as a result the area in rice cultivation was decreasing year by year.¹ The Japanese produced rice on both Saipan and Rota, but lack of surface streams and the rapid draining qualities of the soil proved a limiting factor in expansion. Except for one small plot observed on Saipan, none of the rice areas have been brought back into production by the natives. Most Chamorros and Carolinians regard rice production as being too laborious, although rice is the favorite cereal. Castor beans, introduced as a crop early in the war for export to Japan, now grow as weeds in some areas. Cotton plants are also still to be seen, a reminder of a former small production for local mattress manufacture. Manioc, the second most important commercial crop under the Japanese, has largely been crowded from the fields by weed invasion. A few farmers still raise small quantities for making laundry starch. Coffee was grown on the west slopes of Mt. Tapotchau (Saipan) and on the protected slopes of the southern plateau of Rota. The groves on Saipan have been cleared of brush and vines, and small quantities of the beans are gathered and sold in the local stores. Cacao plantings remain on Rota but are being ruined by encroaching trees, vine growth, and lack of attention. Kapok, also a former Japanese commercial crop, was produced in small quantities mainly from plantings along the roadside and in coffee groves, where they served as shade. The extent of Japanese commercial production by acreage, tons, and value for various crops is shown in Table 10.

The Tinian Produce Company, now disbanded, has been the only large-scale commercial undertaking attempted since the war. Organized in 1947 by four Americans, the company leased approximately 690 acres in Marpo Valley on Tinian Island from the government of the Trust Territory. First priority on the purchase of fruits and vegetables was reserved for military camps on Guam. Since the former Japanese Mandated Islands are not generally open to non-native enterprise, much criticism was directed toward the company and indirectly toward Civil Administration for granting access to the land. Every precaution was taken, however, to insure the protection of the islanders. No native market was displaced by produce from the company, since the Guamese make little attempt to meet the demand on their island.² The company made

¹G. Fritz, 'Bericht uber die Insel Rota,' *Mittheilungen aus den Deutschen Schutzgebieten*, Vol. XIV (1901), p. 197.

²One of the major imports of Guam is food. According to the last census, only 435 persons out of a total native population of 24,139 were listed as full-time farmers, the majority of the Chamorros preferring to work on salary at the military installations. U.S. Navy Department, *Information on Guam* transmitted by the United States to the Secretary General of the United Nations (Washington: Navy Department, 1947), p. 24.

provision for the native employees far beyond that given to most tropical agricultural workers. Labor was drawn from Saipan and Rota, as Tinian had no native inhabitants at the time. Employees were insured, provision was made for medical attention, housing was provided for families and single laborers, a school for the children was initiated, and food and other household needs were supplied at cost. In addition to salaries paid for labor on the farm, each family was permitted to cultivate five acres of company land, to rent needed mechanized equipment at cost of operation, and to sell the commercial crops produced along with those of the company at no handling charge. The company managers had had experience in tropical agriculture in Hawaii and Guam and were interested in experimentation and the introduction of new crops which would eventually be of value in the native farm pattern. Work on the farm proved an education in practical agriculture for the Chamorro and Carolinian laborers from Saipan and Rota. The company, however, eventually came to face financial difficulties arising in part from spoilage of crops due to lack of dependable transportation. Their farm area has now been taken over by the military and continues to produce for the camps in Guam.

Agriculture Problems.

The agricultural needs of the area are numerous and dependent upon many factors other than improvement of techniques and increase of production. The land was highly utilized by the Japanese; it can be made to produce equally well again and to provide the people with an income which will raise the standard of living to and perhaps beyond the now desired prewar level.

Planning to achieve this necessitates a definite choice of policy on the feasibility of developing the area by the inhabitants alone, by the admission of foreign capital and management, or by a combination of the two, and the initiation of a program of orderly development based upon sound principles of land management. The prewar standard of living was supported by commercial agriculture tied with outside markets and cannot be reestablished except on a basis of cash crops.

Transportation and opening of markets are essential to any solution. There is no market within the Saipan District. The small remaining military garrison on Saipan is now being rapidly withdrawn, and no basis for commercial exchange exists among the islanders, since all produce the same crops. While there is a small movement of fresh fruits and vegetables to Guam, transportation is irregular. The farmer is not certain that his produce will be shipped after harvesting, and the merchant in Guam cannot order in expectation of delivery when required. High spoilage and sometimes complete loss of crop are the inevitable result. On Rota, marketable produce is no longer harvested until transportation reaches the harbor; this holds the ship at anchor longer than is necessary for loading and reduces the possible number of trips to market. Guam at present has an American military and civilian population of about 36,000¹ and could easily absorb large amounts of truck from the Northern Marianas, as fresh fruits and vegetables are not produced in sufficient quantities on the island. Two hazards, however, present themselves when Guam

¹U. S. Navy Department, *Information on Guam....to the United Nations*, p. 3.

is considered as a market for long-range planning. The total demand there could be supplied locally should the Guamanians fully utilize their resources. A move in this direction has already been discussed in the Guam Congress. The market is also composed of a transitory population likely to be greatly reduced as military projects now under way are completed. Conferences between the military and island administration on the Washington level as to the probabilities of continued residence here of the present group would be of immeasurable aid in estimating the potentiality of the Guamanian market for future economic planning. Japan, the nearest foreign market, is deficient in home food supply and offers a tremendous market. Because of need for food, Japanese shipping might be induced to enter the area for produce as they did in the German period, provided sufficient quantities were available for profitable commerce.

Because of the limitations of the Marianas market, the introduction of commercial crops for foreign export is a definite need. Preferably there should be more than one as a bulwark against depressions and possible crop failures. The crops selected should have high value in small bulk, to withstand the cost of transportation and still sell at a profit, or should be in such demand that transportation does not enter as a major factor in selling price. Time, however, is likely to eliminate the second advantage as competing areas come into production.

A number of preliminary considerations, geographic, social and economic, require attention in the selection of potential commercial crops. The Marianas have no particular advantages for the production of tropical and semi-tropical crops over other areas of similar climate, and are handicapped by a number of disadvantages. While tropical in general climatic classification, the Marianas lie along the margins of the equatorial belt and not in the heart of the area. The climate is transitional rather than typical. Temperature places no restriction on plant growth, but the seasonal distribution of precipitation is critical in selecting possible commercial introductions (Fig. 40). Rainfall effectiveness is reduced by the calcareous soils, which drain quickly. Typhoons are a hazard to crops, destroying not only groves requiring long periods for growth, but also annual plantings (Appendix A). The small area of the islands sets limits on the extent and expansion of production. Other disadvantages include high transportation costs, the small effective population, the non-commercial attitude of the people toward the land, the high wage scale introduced by the Americans, and the need for a relatively high income.

While the Chamorros and Carolinians have simple needs as compared with an American household, these needs are not simple when measured against those of most native peoples in tropical agricultural areas, and require considerable income. Consumer goods are largely purchased from the United States, an expensive market on which to buy.¹ As mentioned, Japan offers possibilities as

¹These costs will rise in the budget of many islanders when mail is no longer carried to the islands by the Navy. At present many of the islanders bypass the local retail shops, who must add the cost of transportation to their selling price, and order directly from mail houses in the United States, especially in San Francisco. Since naval mail requires postage only to the Fleet Post Office in the United States, the inhabitants now receive their packages with no postage charge for the distance across the Pacific.

an outlet for agricultural produce from the Marianas, but the present high wage scale in the Northern Marianas raises the cost of production so much that goods may be handicapped on the Japanese market. Also most of the islanders have now come to prefer American goods because of their higher quality. If the natives do not buy from Japan, it would unbalance any Japan-Marianas trade relationship and result in a situation which would probably not be acceptable to the Japanese who are in need of an export market.

A major problem in establishing commercial agriculture is the subsistent attitude of the natives toward the land. While they desire a standard of living which cannot be supported subsistently, as a group they have become accustomed to renting their lands and selling their labor as a means of economic advance and so have neither the experience nor the background needed to cope with the present situation. As traced historically in the preceding pages, the natives regard their farms in terms of home food production and do not turn to the utilization of the soil with a full commercial view. It has already been seen that the cash agriculture of the Northern Marianas was the product of Japanese efforts. Guam also remains undeveloped even though it has long been under American administration. While this situation is the product of several factors, the non-commercial attitude of the Chamorro is basic in the problem. This attitude is reflected in the accounts of early voyagers and whalers who had difficulty in obtaining supplies in Guam.¹ It is noted by the Chamorros in the pages of the Guam Recorder,² mentioned in the writings of Laura Thompson,³ and pointed out by American administrators in the

¹As one illustration of the point, Captain William Dampier, who stopped at Guam in 1686, reported that the governor 'sent us supplies saying that he had no more on the island that he could spare.' Captain William Dampier, *A New Voyage Around the World*, (5th ed.; London: Printed for James Knapton at the Crown in St. Paul's Churchyard, 1703), Vol. I, p. 303.

²As one example, the Guam Chamber of Commerce pointed out that 'American Samoa with a total area of 58 square miles as compared with Guam's 210, and with a much smaller area of arable land, produces from 50 to 100 per cent more copra a year than does Guam. Per capita exports were lower in Guam ... than in the other Pacific Islands of Fiji, Tonga, Cook, and British and American Samoa, ranging from \$70.00 in Fiji to \$12.50 in the Marshalls and Carolines and \$2.09 in Guam. Poor copra production was attributed to lack of care of trees, general laziness on the part of the people.... low yield of nuts per tree.' 'Meeting of the Guam Chamber of Commerce,' Guam Recorder, Vol. I (June, 1924), p. 7.

³In 1939, coconut plantations covered 12,000-13,000 acres on the island [Guam], according to rough estimates made by the Department of Agriculture, but the copra harvest was relatively small in quantity and inferior in quality. The meager harvest was due to several factors...low market price...average annual yield per mature tree was only about 30 nuts, that is about 25 pounds of copra, whereas it is estimated that the average output per tree should be about 150 nuts or about 125 pounds of copra ... shallow soils and drought, close spacing of trees and lack of clearing of plantations, coconut pests, mutilation of the trees not only by tapping the buds for tuba but also by hacking steps in the trunks in order to climb them. The inferior quality of the harvest was due to improper sun drying and to the use of green nuts.' Laura Thompson, *Guam and its People*, p. 134.

area. In total, it presents a tremendous handicap in the commercial development of the area and the reestablishment of the former standard of living and public welfare.

Powered agricultural machinery cannot be used to any great degree on Saipan, Tinian, and Rota, although these areas are favored in that they possess more land that could be farmed by machine methods than most of the other Trust Territory islands. Much hand labor is made necessary by the rough and coral-strewn surface, the generally thin soils, the quick growth of weeds due to high precipitation and temperature, and the rapid erosion which occurs over large areas brought under mechanized cultivation. The small native farms do not form a practical base for powered farming, nor can the farmer afford powered equipment. It is apparent that small-scale hand methods, such as have always been used by the natives and which were used by the Japanese, will have to supply the greater part of the energy applied in agriculture. This requires much labor per unit of area, and at present the Northern Marianas lack a labor force sufficient for any large development. Thus, if commercial agriculture is based on native labor, establishment must necessarily be slow.

Many of the tropical agricultural areas around the world lack the mentioned disadvantages and already have an established production and a population experienced in the cultivation of crops with which the Marianas must compete. Any crops selected for commercial planting must compete with world products through efficiency of production rather than through environmental advantages of the area. This poses a difficult problem in the light of native production methods as they now exist.

Potential commercial crops which fall within the island's climatic range (Fig. 40) and meet some of the other mentioned requirements include papayas for papain; derris, pyrethrum, and lonchocarpus, of value for insecticides; pepper, vanilla, castor beans, coffee, cacao, pineapples, sugar, copra, sisal, ramie, and kapok. Except for vanilla, pepper, and the insecticidal plants, all of these are familiar to the Chamorro and Carolinian farmers whether through actual production of them in the Japanese period, participation in production as laborers, or having seen the crops produced. Except for sugar, none of these compete with crops of the United States farmer, although some compete with those of outlying tropical American possessions. Most of the crops mentioned can be produced on small farms with small capital outlay and do not require the establishment of plantations. Some, such as copra, sisal, kapok, coffee, and cacao, present problems in world marketing as shown by past histories of overproduction and highly fluctuating prices. A few could be exported with little or no processing, such as pineapples, which were formerly shipped to Japan as fresh fruit. In varying degrees of importance these crops, with the exception of the ones mentioned as being unfamiliar to the local farmers, formed the major agricultural exports from the Mandated Marianas prior to the war and could conceivably be drawn back again into the Japanese market.

Besides full study of any crops selected for commercial production, particularly as to climatic and soil requirements, cost of production, and long-range markets, thorough experimentation would be needed to determine the best varieties for the area and the most favorable local soils for planting.

Work at the Saipan Experimental Farm might well be coordinated with that of the experimental farm on Guam, which, first under the United States Department of Agriculture and now under the Navy, has already established a large and useful body of information on agriculture in the area. Laboratory work for the determination of the best methods of processing may also be necessary if such information is not already available. Chemurological research seeking possible non-food uses for crops raised in the Marianas might lead to plantings which would do much to establish the islands on a firm economic basis. The work in chemurology of the United States Department of Agriculture, stimulated in part by the loss of imported agricultural raw materials during World War II, has proven of enormous economic advantage to the American farmer. Introduction of selected commercial plants in the Northern Marianas would require agricultural assistance and advice in planting and harvesting. World markets demand a high quality which is difficult to achieve when production is small-scale and harvested quantities are generally too small to be graded on the farm. The British solution to this problem in Africa has been the establishment of central grading stations and control of all processing.

Any development of commercial agricultural production in the area should seek to carry the processing of produce as far as possible, since this will increase value per shipping unit and reduce transportation costs. It will also ensure a greater and more fixed profit, as the distribution of processed goods on the market can be controlled to a greater degree than can the perishable goods of the farmer. Processing is particularly desirable should the Marianas prove a one-crop area commercially, which may well be the case, since investment in plants for several different commodities may require a capital outlay far beyond possible financial return because of the limitations set on agricultural expansion by the small area of the islands. Due to the small and largely unskilled labor supply, the initial venture in processing would have to be small, unless laborers were brought into the area.

Copra.--Most native farmers in thinking of the economic future turn to the traditional crop of copra. While the prices are now high and the market absorbing all that is produced, the prospects of a copra enterprise are difficult to evaluate. The history of production shows an extremely fluctuating price record. Large and more systematically managed areas are now coming back into production in Southeast Asia. If processing could be completed on the islands, sales might be more secure and transportation costs reduced in comparison with those for bulk copra. The American market uses coconut oil primarily for soap manufacture and high grade copra does not command a premium price, but quality oils might be able to gain and hold a market in either Japan or Europe. Copra, however, faces rising competition from various vegetable oils produced in the middle latitude countries, the major consumers of coconut oil. While judgment of the trees is difficult because of the ravages of the coconut beetle, the palms on Saipan and Rota appear of poor quality as compared with those of commercial copra areas in Malaya and the Netherlands East Indies. The present is an ideal time for the introduction of new types, including perhaps the short palm which occurs in the Philippines. While the life-span of this type is shorter than that of the Marianas' trees, productivity is higher and the nuts are more easily harvested. In the world's copra regions, production reaches its height under plantation management. Any venture into plantings on a native production basis beyond the need of

subsistence should be thoroughly considered in terms of varieties, cultivation, fertilization, disease and insect control, processing, and marketing, if the enterprise is to prove successful.

Sugar.--The Japanese sugar industry, of which one is constantly reminded when on the islands because of the neglected cane fields, cannot well be re-developed under present or expected conditions. Even if the now totally destroyed installations could be replaced, the local labor force is too small to conduct the industry. Sugar manufacture on the islands was established and maintained with subsidy and was based on non-native workers, low wages, and primitive methods of cultivation. The small area of the islands and the general character of the surface makes the extensive purchase of mechanized field equipment economically infeasible. Financial success of any sugar project would be doubtful because of initial cost of investment, lack of area for expansion, overproduction on the world markets, the political aspects of the world's sugar industry, and opposition from American cane and beet sugar producers.

Commercial truck farming.--Profitable production of truck for Guam or Japan would require better varieties, parasite and disease control, and fertilization, the lack of which now results in low yields of inferior produce often blemished by insects and disease. Supply of the Guam market might be made an immediate goal, and if well served would supply a capital accumulation divertible to other economic activity should the Guam market disappear because of removal of the American personnel. At present the American group is almost entirely dependent upon frozen and cold-storage fruits and vegetables imported from the United States. While some objection has been raised by the Guamanians to the now small inflow from the Saipan District because of possible introduction of plant diseases and parasites, quarantine regulations are in effect to prevent such occurrence. In fact, there is a feeling among the people of Saipan and Rota that the quarantine rulings are in some cases unwarranted and in other cases enforced with over-severity; that strictness of enforcement arises out of the wish of the Guamanians to supply the market themselves, although at present they make no effort to do so. A definite program is needed, however, to improve quality so that any produce shipped will pass inspection. This will require much effort on the part of the administrators in charge. The work of the United States Department of Agriculture in Guam indicates that any farm program requires extensive guidance, and that the acreage planted and the quality of the yield vary directly with the leadership and the supply of fresh seed made available for sale. Particular care is needed with seeds which quickly lose their vitality in the warm moist climate and are also liable to weevil infestation. Glass and metal containers are best for storage, but even these prove inadequate for protection if the containers are opened at intervals. On Guam, as on Saipan, Tinian, and Rota, transportation proved a critical factor in the truck farming program, the consumer often being unable to buy products which meanwhile spoiled on the farms because of inadequate transport and the cost of movement to market.

Improvement of subsistence farming.--Alongside the development of commercial production, subsistence agriculture should be retained, expanded, and improved by introduction of new varieties, plant breeding, and education in better farming methods. A completely commercial economy, especially in so isolated an area, affords no protection against depressions, typhoons, wars,

or political upheavals, when the islands must fall back entirely on their own resources for subsistence. One of the tragedies of the modern world has been the drawing of native peoples into the world's commercial orbit with the consequent loss of security by displacement of their agriculture. There has often followed an abandonment of many indigenous crops well adapted to area and high in food value. This represents a wastage of resources in many respects comparable to that of careless use of the soil and the wanton stripping of forest lands.

The entire pattern of native agriculture varies so greatly from that of the Western world that any administrator is confronted with a tremendous problem in seeking to bring about improvement. Few scientific studies have been made of native farming, since most colonial powers have been interested primarily in the incorporation of commercial crops into the native system or the establishment of plantations using local labor, rather than in the betterment of subsistence production. The Dutch have probably done the most work in this field as a result of population pressure in East Indian areas, but the total accomplishment has been small. The productivity of native cultivation is difficult to evaluate because of the complexities of applying measurement to interplantings and to the irregular harvest of produce as needed to meet home food supply. Even qualitative measurement is difficult because of the confused appearance of plantings and the farmer's estimates of what quantities he may have carried home. Research under controlled conditions to measure farm productivity for several native farms, even over so short a period as a single year, might yield surprising results. Studies as to how completely native farms supply diet requirements would also be useful in planning. It may be that production in actual food value per unit of area is greater than that under modern mechanized cultivation. Nevertheless, better varieties, insect and disease control, fertilization, erosion prevention, and improved techniques of cultivation would do much to bring about improvement in subsistence agriculture and increase the supporting capacity of the land to meet population expansion.

Since corn is a major subsistence crop among the islanders, scientific research to raise production by the introduction and breeding of drought-, insect-, and disease-resistant varieties of good bearing quality would not only give the farmer more corn per hectare for food, but would also release land for commercial development and for the planting of other crops needed in the human and animal diet. Some basic work in this field was accomplished by the United States Agricultural Experiment Station in Guam before its liquidation in 1932, and the so-called 'Guam corn' grown in the Marianas is apparently the result of their experimentation. Up to the present, it has proven more suited to the area than any recently introduced type. The success with hybrid corn in the United States would indicate that genetic control might also produce a tropical corn of high productivity with characteristics well adapted to local soil and climate.

Rice is the preferred cereal among both the Chamorros and Carolinians, and large quantities are imported monthly to meet the demand. While a few small areas are suitable for wet rice cultivation, in general its production is restricted by both the natural environment and the work habits of the

people. Seeds have now been imported for planting of upland rice.¹ Whatever the results of this first attempt, work with dry rice should be continued and made the subject of experimentation. If possible rice should be added to the crops now cultivated by the farmer, so as to reduce the amount imported.

Livestock and Poultry Problems

The depletion of livestock and poultry has created a serious problem for lack of an easily accessible market for purchasing replacements. Restocking of the islands must come primarily from natural increase of present numbers. The situation affords an unusual opportunity for the public upgrading of stock. Introduction of breeding animals, especially sires, could, by mixtures with the local types, combine some of the advantages of the immunity and hardiness of the present varieties with an improvement of quality.

The improvement of farm animals and poultry should be correlated with an educational program for better animal husbandry; otherwise, any program for better stock will be offset by native inattention to animals. More balanced rations, especially more protein for pigs, sufficient water supply, proper shade, salting of animals, rainproof and enemy-proof shelter for chickens, and more attention to hygiene are needed as well as better quality of stock, if productivity is to be improved. Because of the mild climate, housing for cattle is not needed, but pasturing is preferable to tethering, particularly if a dairying industry is initiated. This would require fencing, which is generally impractical in the present situation because of expense and the small pasture area on native farms. Any animal program, as is true of all improvement of native agriculture, must necessarily be long-range and cannot be expected to achieve quick results.

Cattle.--The farmer needs a triple-purpose animal for draft, meat, and milk. While biologically these three functions are unattainable at their best in a single animal, the improved types achieved on Guam through admixture with Jersey stock brought in by the Navy and later through work by the United States Agricultural Station with Ayrshires is indicative of the results which can be obtained. The offspring were larger in size than the native cattle, possessed better milking qualities, and showed no apparent loss of vigor. Other suggested breeds for introduction are Holstein and Brown Swiss. While Brahma cattle might be a good breed to import because of their resistance to ticks and adaptability to warm weather, their function is chiefly that of a meat and draft animal, and their milk production is low. It appears inadvisable to import herds of purebreds, especially dairy cattle, as was demonstrated by the experience of the Navy and the U.S.C.C. on Guam. Upgrading usually proves most successful with cattle when the sires are distributed in the farm areas rather than being available only at the agricultural experiment station, but this procedure would entail native care of the bulls, which is not likely to prove satisfactory.

¹Statement by Mr. Ignacio Benevente, Agricultural Agent, Saipan, in a personal interview, May, 1950.

Several Chamorros expressed an interest in raising dairy animals for the local sale of milk. A few reported having sold milk prior to the war and indicated a limited knowledge of the small dairy industry as formerly maintained by the Japanese on Saipan, Tinian, and Rota. There is little prospect for such an industry at present because of the scarcity of animals, poor stock, and the general inexperience of the natives in the handling of animals and dairy products. There is, however, a definite need for increasing the milk-producing capacity of local cattle in order that more milk can enter the native diet.

The development of a beef cattle industry geared to the Guam market, or perhaps to a Japanese outlet, is a commercial possibility since wide areas of land are now unused agriculturally. Importation of stock would be necessary to initiate the industry on any scale, since not even through association could the local farmers spare enough animals for a commercial undertaking. Two or three Guamanians have expressed an interest in operating a grazing project on either Tinian or Rota, but there is a general feeling among the islanders that this should not be permitted. A small cattle association functions on Rota but has only three animals in pasture, and these must frequently be withdrawn for draft purposes. On Rota, water is a problem on the upland areas in the dry season, but the cisterns on abandoned Japanese farms might be utilized for a small project. Tinian, because of numerous drillings made during American military occupation, has an abundant water supply.

In general, most of the pasture plants of the Marianas are of sustaining rather than fattening value, and establishment of commercial grazing would require introduction of better forage. Since it was customary among the Japanese to stable rather than pasture their animals, grass plantings were made along roadways and around fields to be cut as needed and carried to the animals. Napier grass (*Pennisetum purpureum*) was the most widely grown, but Bermuda (*Cynodon dactylon*) and Hilo (*Paspalum conjugatum*) also occur. Creeping indigo (*Indigofera endicaphylla*), tropical kudzu (*Pueraria phaseoloides*), and tangan-tangan (*Leucaena glauca*), while occurring on the islands, apparently were little used by the Japanese for cattle feed. If pastured in rotation, the sugar cane could be utilized as forage for several years and gradually replaced as the stands decrease by Napier, Para (*Panicum molle*), Bermuda, Guinea (*Panicum maximum*), or Paspalum (*Paspalum dilatatum*) grass, or by a legume such as tropical kudzu, Spanish clover (*Desmodium canum*), creeping indigo, or other forage plants.

The establishment of a grazing industry requires careful consideration not only as to economic feasibility but also in relation to the possibilities of expanding settlement. Importation and wide sowing of new grasses would further the production of stock but might create a serious weed problem for native agriculture. Waste areas unsuitable for agriculture, such as some of the thin-soiled areas on the uplands of Rota, might be set aside for permanent pasture, but in some sections rugged terrain would be hazardous to animals. Production of commercial beef would necessitate bringing feed crops such as legumes and grain sorghums into the native farm pattern; but this is needed, although to a less degree, for improvement of all livestock diet on the islands. As with all enterprise directed toward sales outlets, guidance and training would be necessary both in the proper care of animals and in the proper cutting of meat.

Hogs.--Berkshires and Yorkshires offer possibilities for crossbreeding with local stock to improve quality, or for introduction for raising purebreds. Since reproduction rates for swine are more rapid than for cattle, it might be feasible to build up a herd of swine at the Saipan Experimental Farm from which sales could be made to the farmers for breeding stock. If possible, purebred sires should be purchased and kept at the Experimental Farm or in the farm areas for free breeding services.

Chickens.--Since the native desires chickens for both meat and eggs, dual purpose types such as New Hampshire, Rhode Island Red, and Rockshire are suggested for crossing with native varieties. Experimentation in crossbreeding to preserve some of the hardiness and resistance of the local fowl is desirable because of the little attention the native farmers are likely to give their poultry. Work of this nature conducted by the United States Department of Agriculture in Guam by crossbreeding Rhode Island Reds with native stock gave an increase in egg and bird size but reduced egg-laying capacity, perhaps because of low egg-laying capacity in the imported stock.¹

Increased poultry and egg production affords commercial possibilities for the sale of meat and eggs to Guam, as well as opportunity to add more protein to the diet of the islanders. The problems facing such a project in the Saipan District are the same as those which account for the insufficient market supply in Guam: lack of knowledge of proper care and handling of poultry, disinclination of the people to practice new and improved methods, diseases, inadequate feeding, poor quality of stock, theft, and destruction of young chickens by rats and iguanas.² Here, again, as in all commercial agricultural activity to be conducted by the natives, much aid and guidance would be necessary if the improvement needed to meet market demands is to be made.

Control of agricultural parasites and plant diseases.--Insects, rats, snails, and plant diseases take heavy toll of the farmers' crops and constitute a menace to the establishment of commercial agriculture. The European Corn-Borer, coconut parasites, weevils, aphids, corn-ear worms, leaf hoppers, the fruit fly, banana-root borers, and numerous other insects damage the plantings, as do also downy mildew, stem rot, rust, leaf spot, fruit rot, scab, and other plant diseases. Native agricultural practices include neither many nor very effective measures for combat. Uniformly high temperatures and frequency of rainfall add to the difficulties of control. Civil Administration early recognized the problem involved and maintains an entomologist in the field. Also, in cooperation with the Pacific Science Board, the Trust Territory government has established the 'Insect Control Committee for Micronesia' and supplies transportation and assistance to scientists sent into the area to

¹U. S. Department of Agriculture, *Annual Report of the Guam Agricultural Experiment Station*, 1924, p. 5.

²'Letter from Agricultural Experiment Station to Governor Price', *Guam Recorder*, Vol. II (June, 1925), pp. 99-100.

work on the more destructive parasites. Emphasis must necessarily be placed on preventive measures which generally prove less expensive and more effective than corrective techniques of control such as spraying and dusting, which at best are only palliative. Introduction of parasites, resistant plant varieties, and prophylactic measures such as the use of clean seeds and plants, rotation, and quarantine are all practical measures to be taken. Some of these, as for example the introduction of parasites, require careful experimentation and consideration before being applied in the area. Efforts should first be directed against diseases and pests which are most likely to attack commercial crops established to raise the native income, unless, as with the African snail, both commercial and subsistence plantings are threatened. This double approach must necessarily be taken if truck is produced for the Guam market, not only to increase production, but also to produce fruits and vegetables without blemish. In most cases, however, damage to subsistence production, while a problem, does not at present hazard local food supply.

African snail.--The agricultural future of Saipan, Tinian, and Rota is definitely contingent upon the eradication or control of the African Snail (*Achatina fulica*) (Figs. 67, 68, and 69). Reportedly introduced by the Okinawans for food, it has escaped and overrun the islands, finding an ideal habitat with abundant vegetation, lime for shell growth in the coralline rocks, and no natural enemies.

Langford reports that the eggs of the snail hatch in four to ten days, the young snails growing at a uniform rate until four weeks old, after which they increase in size at various rates, large specimens attaining a length of six inches in perhaps three years.¹ The snails are nocturnal but also feed and travel on rainy and cloudy days. If the dry season becomes extreme, the snails are able to seal their shells and pass into a state of estivation. No type of vegetation appears safe from their attack, but the damage to natural vegetation is negligible as compared with that of farm and garden crops. Langford believed that the snails on Tinian were diseased,² and Fosberg reported that the snails on Saipan were much less abundant in 1950 than they were in 1946.³ An abundance of empty shells of various sizes occurs over the surface, sometimes in piles, but it is questionable to the writer whether this indicates disease among the snails or is the result of the abundance of lime in the local rocks, a condition making it unnecessary for the snails to consume the shells of the dead. The snails are so abundant that the farmer often harvests his garden crops before they fully mature. Native methods of combating this menace include picking, fencing gardens with finely woven screen if available, protecting individual plants by screen guards and tin cans, and digging steep-sided trenches around fields. These

¹Daniel B. Langford, 'Investigation Concerning the Giant African Snail,' (U.S. Commercial Company Memorandum, POA-Memo-60, Honolulu, March, 1947). (Mimeographed)

²*Ibid.*

³Statement by F. R. Fosberg in personal conversation.



FIG. 67. Giant African Snail (*Achatina Fulica*).
Feeding on taro leaf.



FIG. 68. Tinian: Giant African snails on airstrip.
The snails are nocturnal but also feed and travel on
cloudy days.



FIG. 69. Rota: Trench bordering field to entrap
snails.

measures offer considerable security in dry weather but are not snail-proof during the rainy season. Calcium arsenate and metaldehyde pellets form an effective poison if used frequently, but this necessitates removal of the dead snails, especially if near a dwelling, as they create disagreeable odors, attract myriads of flies, and are a danger to animals and poultry. In combating snails, the Tinian Produce Company left a strip of open ground between fields and uncleared areas so that snails failing to entirely cross this stretch during the night would die of exposure to heat during the day. Poison was also distributed every other day. In spite of these precautions, it was necessary to send workers through the fields to pick snails. Because of overwhelming numbers, widespread distribution, and habit of seeking shelter under brush and dead vegetation, no measures other than the introduction of some natural enemy appear likely to bring the snail under control. Through efforts of the Pacific Science Board and the Navy, two forms of carnivorous snails, *Streptaxis kibweziensis* and *Edentulina affinis*, have been brought to Honolulu for study at the Bernice P. Bishop Museum and for possible introduction to the islands to combat the African species.¹ If proven successful under laboratory conditions, it is proposed to release some of the carnivorous snails on the small, uninhabited island of Aguijan in the Marianas for further testing before any are released in populated areas.

Various proposals for the economic utilization of the snails have been made, but since eradication is desired, any industry developed would eliminate the resource, unless breeding could be continued under stringent control to prevent escape of the snails or accidental distribution of the eggs. With drying and grinding, snails could be utilized as a high protein feed for chickens and hogs and thus supply a much needed element lacking in the present animal diets on the islands. Since the Okinawans used snails as a food resource, drying or canning for export presents another possibility. According to native informants, a small export of dried snails was maintained before the war.

Saipan coconut beetle.--The depredations of the Saipan coconut beetle (*Brontispa mariana*) have been so extreme on Saipan, Tinian, and Rota that it was at one time thought necessary to cut all palms and to avoid replanting for at least two years in order to bring the pest under control. Investigation on Saipan showed that only 32 per cent of the palms were bearing nuts and that all the trees were in slow decline. Through the work of Lange, studies were made of parasites in the Philippines, Siam, Malaya, and Java, and two insects, *Tetrastichus brontispas* (Ferriere), a larval and pupae parasite, and *Haeckeliana brontispae* (Ferriere), an egg parasite, were introduced. Because of the scattered distribution of the remaining coconut palms on the islands, it was feared that the parasites might not be able to migrate the sometimes long distances between trees, and artificial distribution was necessary. Recovery of insects has shown that *Tetrastichus* is now

¹The experimental work in Honolulu is being conducted by Mr. Yoshio Kondo.

multiplying with definite improvement in the palms, but it is believed that *Haeckeliana* has not become established.¹

Rats.--Control of rats is also imperative. Because of the removal of human controls by the repatriation of the Japanese, rats overrun the islands in enormous numbers; it is roughly estimated that there are from four to five million on Saipan.² While they are not known to transmit any disease, they cause excessive destruction of small chickens and crops and in some areas have forced the farmers to abandon the planting of crops for which the rats have preference. Field trapping is used to deplete the rat reservoir in inhabited areas, but Civil Administration has had neither the funds nor the staff to attempt control of the large uninhabited areas of sugar cane fields, deserted barracks, and open storage spaces. Effective control and partial elimination of the problem on Saipan, Tinian, and Rota would require at least two rodent control officers, a crew of thirty men, and adequate equipment and transportation.³ Traps and poisons have been issued to the farmers, but the problem has outgrown ordinary methods of solution. Since it is estimated that each rat killed in the housing area is at a cost of thirty-five cents to the sanitation department, it would appear more economical to offer a five-cent bounty to the islanders for each rat taken.⁴ The teen-age boys in particular would be stimulated by such a project, and efforts would be extended over a wider area than that now occupied by housing.

Animal and poultry diseases.--Fortunately the Northern Marianas have no rampant animal diseases, as do many tropical areas. U.S.C.C. encountered the Texas Fever Tick with cattle; cholera, lung, and kidney worms in hogs; and a disease resembling anthrax among both cattle and hogs. Liver fluke has not been discovered but is present on the lowlands of nearby Guam, where it caused a serious problem in the herd of dairy cattle maintained by U.S.C.C. It is essential that strict quarantine be maintained to prevent the introduction of diseases, as the natives have no adequate means of combat. Poultry diseases appear more prevalent than those attacking animals; chicken pox, diarrhea, roup, and various worm diseases are common. The usual methods of treatment among the natives include putting coffee into drinking water, applying coconut oil to the chicken's head, or cutting the comb with a sharp knife to cause bleeding.

¹W. Harry Lange, Jr., 'The Biology of the Marianas Coconut Beetle,' *Proceedings, Hawaiian Entomological Society*, Vol. XIV (1950), p. 150.

²U.S. Navy Department, Civil Administration Unit, Saipan, 'Quarterly Report, July 1 - Aug. 31, 1948,' Enclosure A, p. 9.

³*Ibid.*

⁴This method was followed by the Germans, who offered five pfennig for each rat.

Summary

Any program for the improvement of native agriculture, whether directed toward commercial or subsistence ends, is dependent upon the establishment of an adequate, well-trained agricultural staff, qualified not only by education and experience, but also by patience, understanding, and ability to work with the people. The native farmer, besides being a victim of the war, is also a victim of his small plot of ground, his traditional agricultural practices, and his non-commercial attitude toward production. While he possesses the innate ability to attain his prewar standard of living, he cannot do so without sympathy and guidance. American experience among people of the same race in Guam has shown that advancement is slow; numerous enterprises instituted by the administration to stimulate the area commercially have met with only limited success. The German regime in the Northern Marianas resorted to administrative rulings with the force of law to increase coconut, fruit, and vegetable plantings. The Japanese offered prizes for quality products and animals, granted subsidies for desired crops, and disseminated the findings and suggestions of the agricultural experiment station through the rural police. Under both administrations, improvement of native agriculture was slight. American Civil Administration has followed a program based on education, suggestion, leadership, and demonstration. The results in many cases have been disappointing. From a study of colonial agricultural policies, it appears that the ideal way to aid the native and to improve his farming practices as well as raise his income is through cooperative associations. This requires experienced administrative supervision until such time as the people are able to assume control. This procedure, which is merely in its beginnings, is followed in only a few areas of the world, and the results that may accrue over a period of years are as yet unknown. The greatest success has been attained in the Gilbert and Ellice Islands, where native cooperatives harvest the coconuts, sell the copra, and purchase and retail trade goods.¹ A major problem in organizing and maintaining cooperatives in the Northern Marianas is finding native leaders capable of conducting affairs and following group instead of personal or family interests. Even though the earlier farm associations have not proven successful, their reorganization, if possible with initial subsidization of production and marketing, seems advisable.

¹Felix M. Keesing, *The South Seas in the Modern World* (New York: John Day Company, 1945), p. 123.

The Soil and Associated Problems

Soil is the major resource in the northern Marianas. It has been the basis of economic life from the first settlement of the islands by the Chamorros, it sustained the islanders after the destruction of the Japanese economy, and it forms the basic resource for the reconstruction of the area. Only with careful management and protection can it be returned to its former productivity.

Types of soils

The soils of the Marianas are of only fair fertility and are soon depleted of plant nutrients and humus when under cultivation.¹ The process of laterization operative in the area has tended to leach away the bases and silica and accelerate the accumulation of iron and aluminum, producing a soil high in clay but relatively porous to water. On a generic basis, five types of soil are to be distinguished in the area:

(1) Volcanic.--Soils of this category occur in a number of physical settings: (a) in areas of recent volcanic action, as in the northernmost Marianas where soil formation has taken place in the valleys and on lower slopes of gentle gradient; (b) where igneous materials have broken through the madreporic covering; (c) or have been exposed by erosion; (d) or left uncovered by coral during the geologic evolution of the islands. The volcanic soils tend to be of fine texture, plastic, red to red-brown in color at the surface, and to merge into yellow-brown and red-brown plastic clays at depths from seven to ten inches. Average soil depths are from twelve to twenty feet. According to Japanese studies, these soils derived from andesitic lavas are high in silicic acid, contain a favorable silica-aluminum ratio, and are generally high in nitrogen and phosphorus when first brought into use.² Most of the areas of volcanic soil tend to erode into rolling to steep relief. Erosion is extreme on the slopes and ridges if the vegetation is stripped away. Sword grass is the usual vegetation cover.

(2) Coralline.--This is the most widely distributed type of soil on each of the three islands, occurring on the raised limestone terraces in generally shallow depths from nine to sixty inches. (Fig. 70). When fully developed, coralline soils tend to be red or red-brown friable loam at the surface and trend into yellow-red and yellow-brown clays or clay loams at lower levels. Coral fragments, varying in size up to twelve or more inches in diameter,

¹The author is greatly indebted to Dr. Oliver C. Rogers for his expenditure of time in conversation concerning soil problems in the Marianas and for the value of his *Report on Soils of Micronesia*, Vol. XII, *An Economic Survey of Micronesia* (Honolulu: United States Commercial Company) 1946. Unpublished; Library of Congress, Microfilm.

²Director of Experiments, Rota Sugar Works Agricultural Department, 'Twelfth Report of the Director of the Rota Experiments, 1938' (translation prepared for U. S. Commercial Company, Honolulu 1946), p. 9 (Typewritten.)

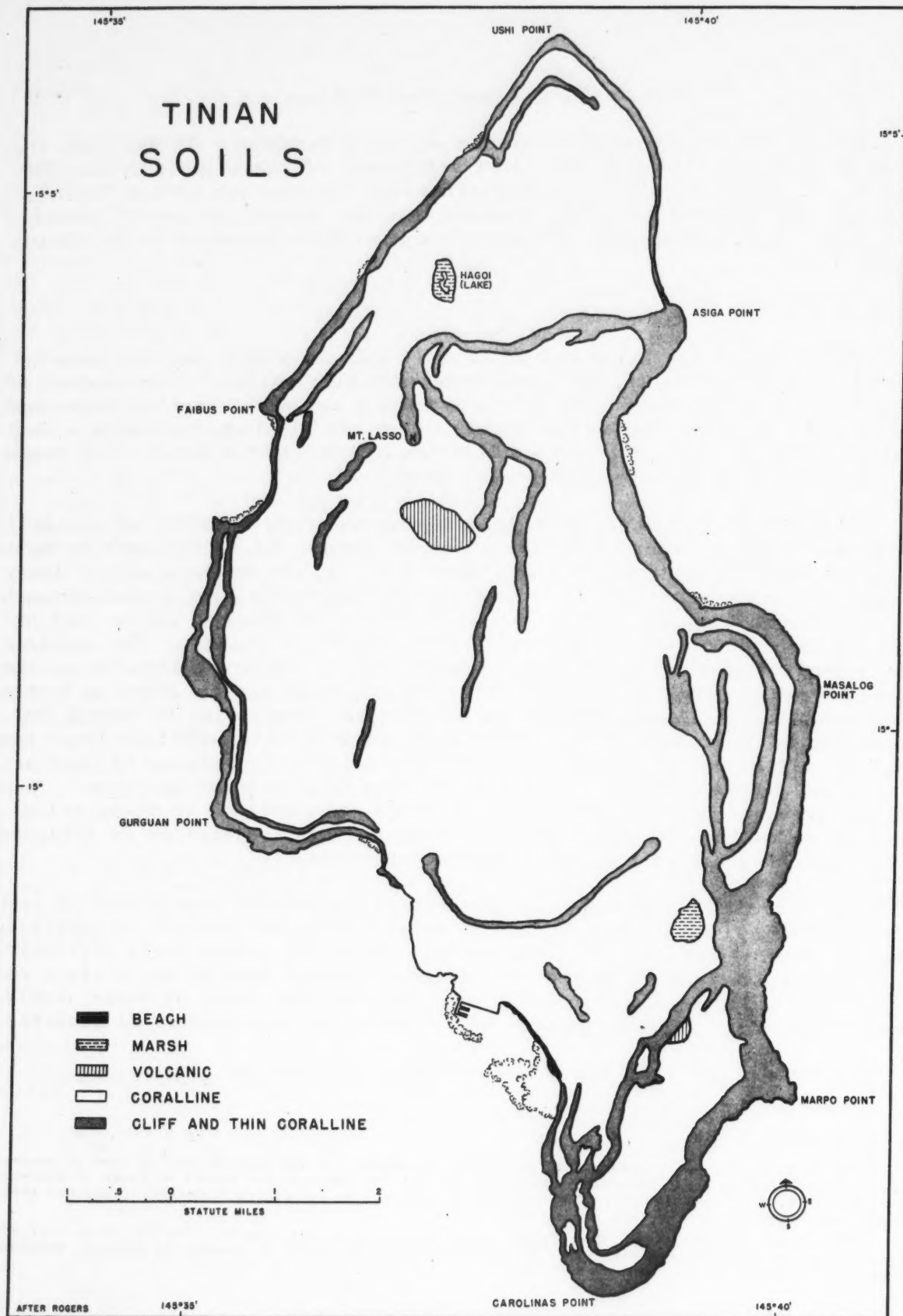


FIG. 70.

frequently lie over the surface and occur throughout the profile. On Rota, where much of the soil is rocky, the Japanese often gathered the surface rocks and stacked them in piles. Coral limestone frequently outcrops in the coralline soils, and the line of contact between soil and bed rock shows considerable disconformity, the soil extending downward into pockets in the madreporic D horizon (Fig. 71). Japanese studies indicate that this soil type is very low in silicic acid, high in iron, and especially high in aluminum.¹ Except along terrace edges, coralline soils occur in areas of level to slightly rolling relief; gullying is infrequent but sheet wash is sometimes severe. On slopes, water may wash away all the finer soil particles, leaving the surface covered with coral rubble. Forest is believed to have been the original vegetation cover over the coralline soils, but this has been largely cut away in order to bring the land under cultivation.

(3) Volcanic-Coralline.--In some valley areas, alluvial action has mixed fine-textured volcanic and coralline materials, producing a heavy clay soil.

(4) Marsh.--High in organic matter, these soils range from dark-grey clay loam to clay. Marsh soils occur on Tinian at Hagoi and near the head of Marpo Valley and on Saipan around Lake Susupe. As Susupe is slightly brackish, the adjacent soil may contain salt; but the outer margins of the marsh were used by the Japanese for rice production, and some of the higher sections are at present cultivated by the natives. Reeds and grasses are the characteristic vegetation.

(5) Beach.--Loose, medium to coarse coral sand, which is grey to yellow-grey in color and from three to ten feet in depth, overlies coral limestone along the beaches and occasionally extends inland, as at former Tinian Town and at places on Saipan between Agingan Point and Tanapag.

Japanese soil classification and soil studies

In leasing for sugar cane and tapioca production, the Japanese classified land as A, B, C, or marginal, on a basis of soil quality, depth, and terrain. Unfortunately the records and maps concerning these classifications have been lost, and the natives are not fully cognizant of the system. As applied on Rota² Class A soils were andesitic, Class B soils were undescribed, and Class C and marginal soils were on the slopes of hills and knolls. Approximately 60 per cent of the soils of Rota were classified as Class C or marginal. Numerous soil experiments were conducted, not only on Rota, but also on Saipan and Tinian, to determine soil constituents. Reports on most of these have been lost.

¹Director of Experiments, Rota Sugar Works Agricultural Department, 'Twelfth Report of the Director of Rota Experiments, 1938.' p. 9.

²Director of Experiments, Rota Sugar Works Agricultural Department, 'Twelfth Report of the Director of Rota Experiments, 1938.' p. 2.

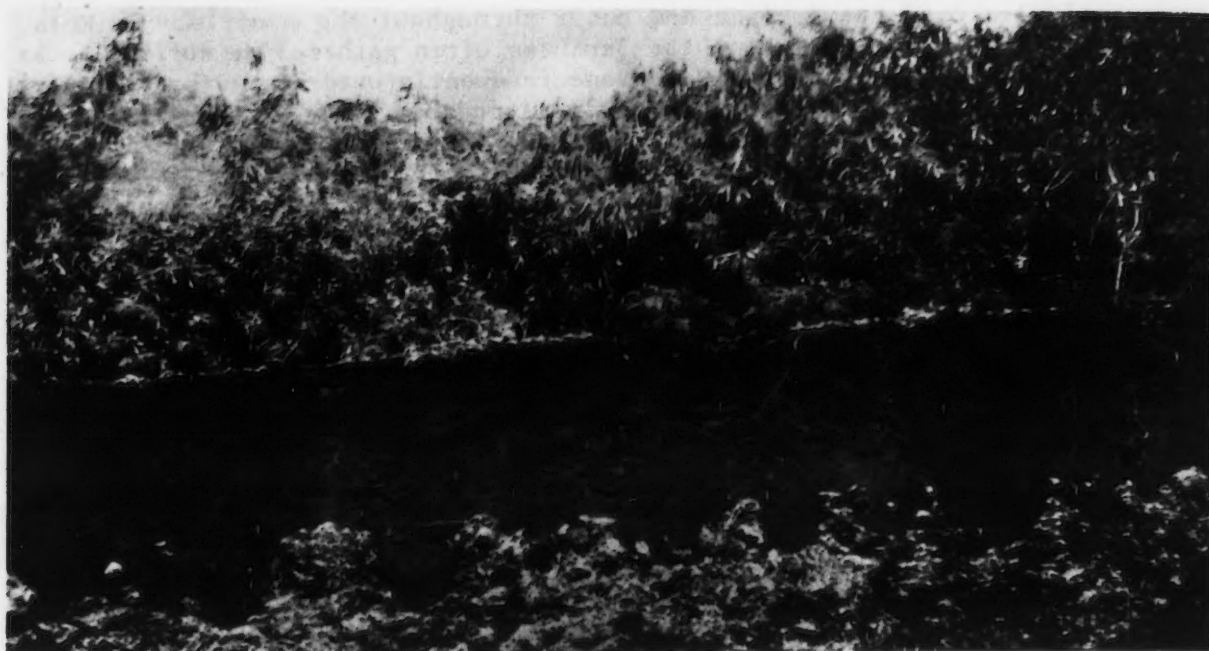


FIG. 71. Tinian: Characteristic coralline soil profile. Note thin layer of coral fragments on surface, and disconformity with D horizon. Vigorous stand of *tangan-tangan* (*Leucaena glauca*) growing on surface.

Native soil practices

Native methods of soil care are not adequate to maintain productivity. The earliest inhabitants probably practiced milpa agriculture, and soil fertility eventually renewed itself by the return of depleted crop lands to jungle. As the islands became more and more restricted by foreign systems of land tenure, shifting cultivation was no longer possible, and the native farmer was reduced to the continuous use of a single plot. Because of the close interplanting of trees and crops, much of the small-scale hand cultivation of the native farmer is not particularly conducive to erosion. The introduction of field crops and the practice of plowing without regard to contour slope leads to accelerated soil waste (Fig. 72). The use of fire for clearing results in damage to humus and micro-organisms necessary for soil fertility. Heavy rains and subsequent leaching and oxidization by the tropical sun soon reduce productivity. The only fertilization received is from decayed weeds, corn stalks, and other crop residue. Since the farm animals are not stabled or penned, manure is seldom available in sufficient quantities for use. Unless pressed for land, the native farmer may allow about one-third of his land to lie fallow for two or three successive years in order to improve soil quality and to provide pasture. Although commercial fertilizers are familiar to the islanders through observation of Japanese and American practices, their purchase is in most cases beyond the farmer's budget.



FIG. 72. Saipan: Hillside cornfield. The native practice of plowing and planting up and down slopes increases erosion.

Soil reclamation

The security of the soil on Saipan, Tinian, and Rota is dependent upon three constructive measures: (a) repair of the physical destruction resulting from war-time construction, (b) reestablishment and maintenance of soil fertility, and (c) education of the natives in proper methods of soil conservation.

The construction of American military installations in some areas has caused such damage that reclamation measures are necessary in order to return the soil to productivity. All of the processes involved are time-consuming and costly, requiring equipment not available to the farmer and funds beyond the ability of the local populace to raise. In general the areas requiring reclamation fall into seven broad categories:

(1) Areas in which crushed coral from one to eight inches deep has been laid down over the surface to provide drill grounds, foundations, and surfacing suitable for mechanized equipment. If the coral is only from one to three inches deep, it should be plowed deeply so as to distribute it throughout the soil to a depth of sixteen inches. This would require a subsoiler. In cases in which the coral is deeper than three inches, the greater part of the surfacing should be removed before plowing.

(2) Areas in which the top soil has been scraped away in order to level the surface or to provide earth for making foundations and bunkers. If the underlying coral limestone has been uncovered by these operations, soil needs

to be laid down over the surface. If the subsoil still remains to the depth of twenty to twenty-four inches, the addition of fertilizer and a planting of a green manure crop is necessary.

(3) Areas utilized for bomb storage. Here bunkers from six to eight feet high have been constructed, usually by scraping up the surrounding soil but in some cases by hauling in soil and coral. The space inside the bunkers is often surfaced with coral two or three inches deep. In some of these areas, the demolition of bombs has opened holes in the surface and scattered coral fragments torn from bed rock over the surface (Fig. 73). Leveling is first necessary to smooth and scatter the soil, after which a cover crop should be planted.

(4) Areas of oil dumps and tanks (Fig. 74). This situation presents a problem not certain of solution. The soil should be broken up to permit drainage, after which resurfacing would be necessary. If the soil is too saturated with oil, the procedure will not prove successful.

(5) Camp areas containing coral-surfaced driveways and paths. These areas can be reclaimed in the same manner as mentioned for areas of type one.

(6) Areas of abandoned airfields. For financial and strategic reasons, it is probably not feasible to reclaim any of the airfields. However, the abandoned fields surfaced with crushed coral, as the two former Japanese strips on Tinian, could be reclaimed by techniques mentioned for type one. Since the coral on these strips is over eight inches deep, removal of the surfacing would be required.

(7) Areas of accelerated erosion. In some areas, bulldozing and other activities connected with military construction have laid the surface bare. Natural vegetation is repairing the damage in some cases, but where stripping was extensive, wind and water erosion are in advance of plant capture, and planting is necessary to prevent further soil destruction.

In reclaiming the mentioned areas, it would be desirable to clear the surface of large coral chunks by stacking them in piles or, if the surface is sloping, in lines across the slope so as to check erosion. The reclaimed areas should then be planted with legumes or forage grasses in order to build up the humus content of the soil and to keep out weeds. Suggested legumes which should thrive well in the area include: black medic (*Medicago lupulina*), Kaimi Spanish clover (*Desmodium canum*), Florida beggarweed (*Desmodium tortuosum*), creeping indigo (*Indigofera endecaphylla*), tropical kudzu (*Pueraria phaseoloides*), and soy beans (*Glycine hispida*). Among the forage grasses which might be introduced are: Sudan grass (*Andropogon sorghum*), Pualele (*Senchus oleraceus*), buffalo grass (*Stenotaphrum americanum*), Paspalum (*Paspalum dilatatum*), Bermuda grass (*Cynodon dactylon*), Guinea grass, (*Panicum maximum*), and para grass (*Panicum molle*).

Tangan-tangan (*Leucaena glauca*) has been suggested by some agriculturists as a valuable legume for forage and soil building in reclaimed areas. It is, however, one of the most dominant of weeds on Saipan, Tinian, and Rota, growing under a wide range of environmental conditions, forming solid stands, sometimes reaching heights of fifteen to twenty-five feet, and shading out all

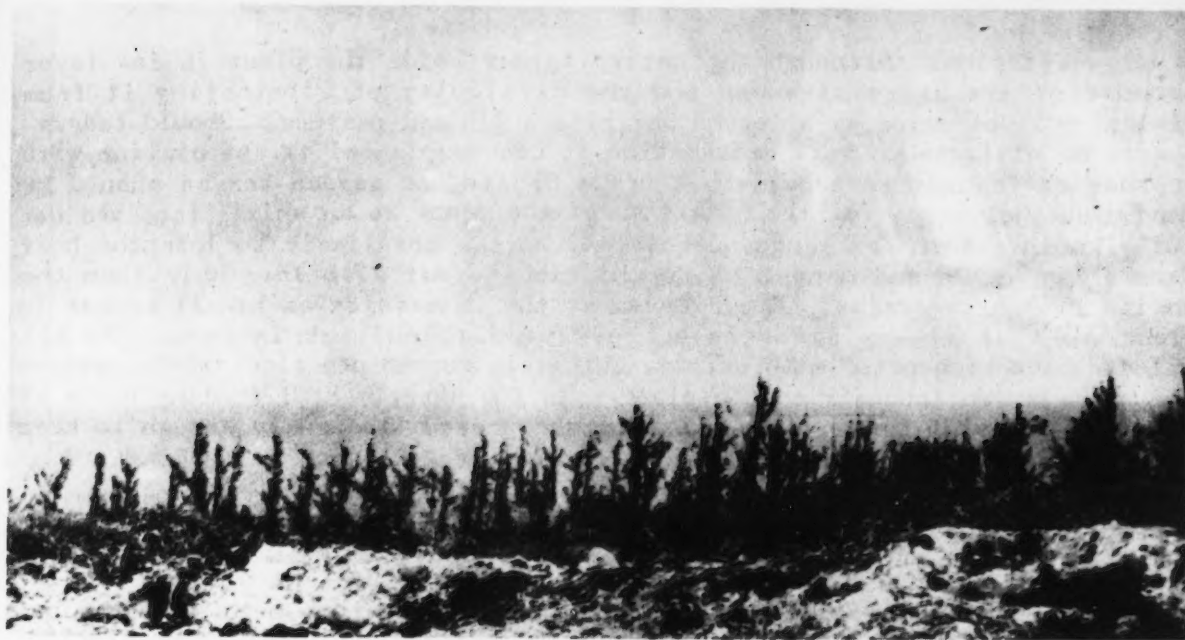


FIG. 73. Tinian: Bomb craters and strewn coral blocks in bomb demolition area. Note damaged vegetation in background.

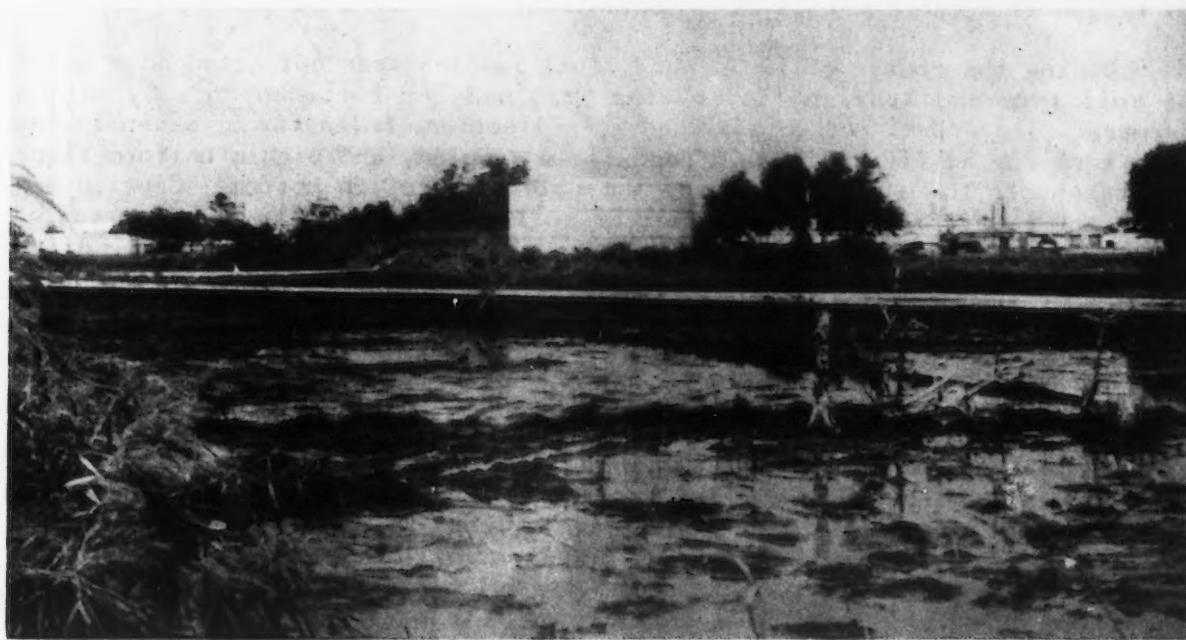


FIG. 74. Saipan: Soil damage resulting from oil.

other vegetation. Although the native farmer holds the plant in low favor because of its aggressiveness and the difficulty of eliminating it from fields, it is of value as a legume and offers limited pasture. Should *tangan-tangan* be utilized in soil reclamation it can be planted in association with grasses or legumes to provide pasture. Grazing on *tangan-tangan* should be conducted with care, for the qualities of the plant as an animal food are not fully known. When fed large quantities, horses are likely to lose the hair from their tails and manes. Pigs and rabbits may also lose hair from the eating of *tangan-tangan*. Experiments at the University of Hawaii appear to indicate that it may also cause breeding difficulties in hogs. No ill effects have been noted with cattle, but it is common practice not to pasture the animals continuously on the plant. In the experimental feeding plots at the University of Hawaii, the pastures are grazed frequently enough to keep the *tangan-tangan* at heights of four or five feet.

Maintenance of soil fertility

The maintenance of continuous soil productivity is a complex problem involving many variables. Humus, tilth, moisture-holding capacity, chemical components, soil fauna, micro-organisms, and weather are all important factors requiring consideration. These interlock in an intricate complex requiring study and experimentation if a successful balance in fertilization is to be achieved. While much work was done by the Japanese, particularly in relation to the soil and sugar production, its extent is unknown and the availability of the records uncertain. In consequence, the basic work of soil study must be redone if agriculture is to be established on a firm basis.

During the course of field work, soil samples were collected on a basis of soil type and availability of the area sampled for occupancy by native farmers. The trowel method was used in collection; holes six or seven inches deep were dug at five points in each field sampled, and a thin uniform slice was taken off the straight side of the hole from top to bottom. Caution was taken not to mix light and dark colored soils, or sandy, clay, or loam soils, and to avoid mixing samples from hill sides, flats and depressions. After drying, the soil samples were screened to remove all foreign matter such as stones, twigs, and fibers, and the dried samples were crushed. One pint of prepared soil from each area sampled was forwarded to the Agricultural Extension Service at the University of Hawaii, where soil tests were run and recommendations made for fertilization.¹

From the analyses of soil samples taken in field work (Table 13 and Fig. 75), the soils of Tinian and Rota were shown to contain sufficient calcium for most crops and to possess a favorable pH factor as compared with the soil guide used in Hawaii (Table 14). On Saipan, this general characteristic applies to lowland soils, but on the raised terraces most crops would be benefited by an application of lime at the rate of about two tons per acre.

¹The author is grateful to Dr. H. H. Warner, Director of Extension; Dr. G. D. Sherman, Soil Chemist; and Dr. Z. C. Foster, Soil Conservationist, for analyses of soils and recommendations for fertilization.

LOCATION OF SOIL SAMPLES

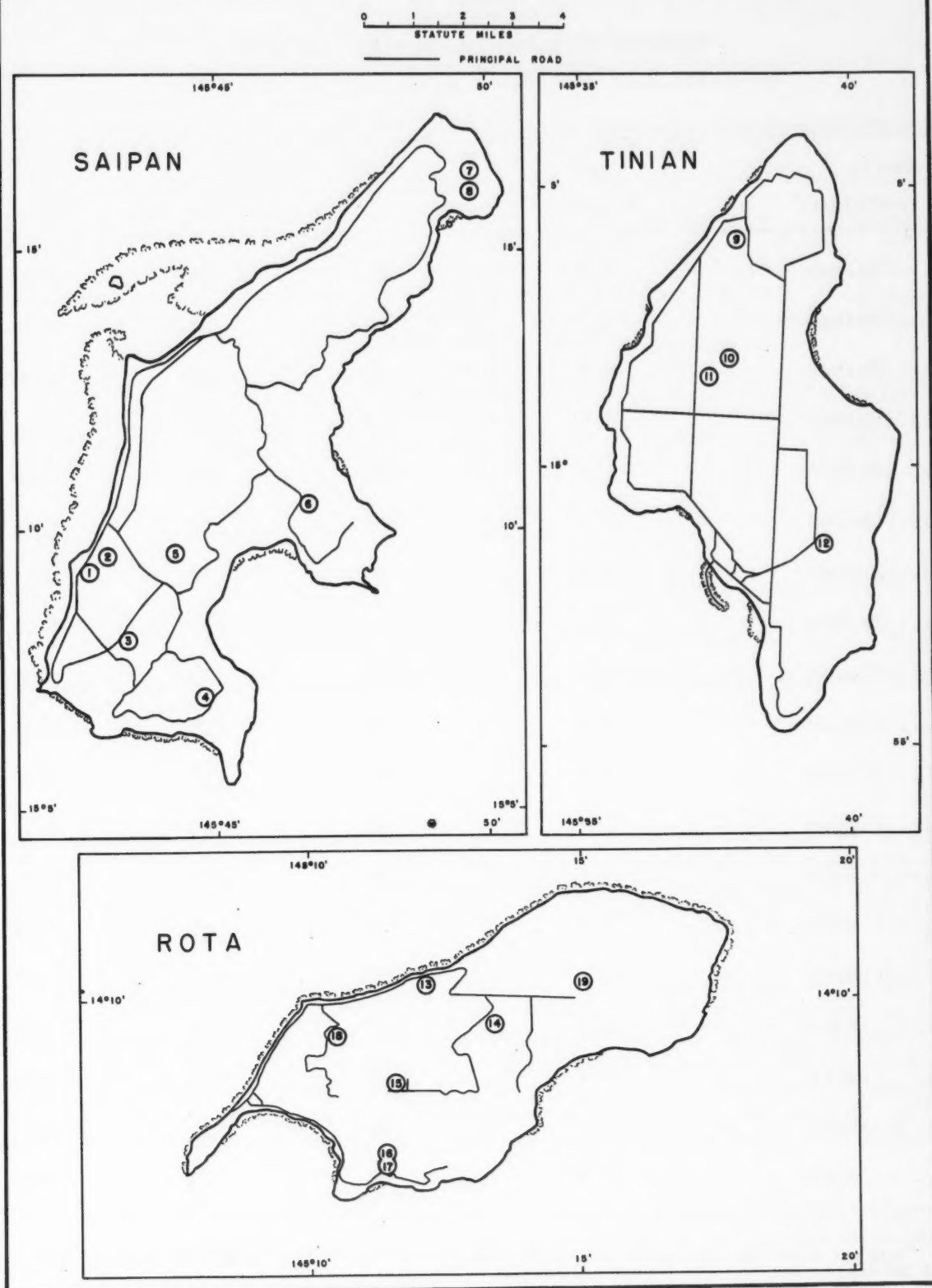


FIG. 75

TABLE 13
 READILY AVAILABLE PLANT FOOD PER ACRE
 SHOWN BY SAMPLINGS FROM SAIPAN, TINIAN, AND ROTA^a

Sample No. Location ^b	pH. Factor	P_2O_5	K_2O	CaO
		Pounds per acre		
1.....Saipan	7.2	<60	50	>9000
2.....Saipan	6.2	60	75	9000
3.....Saipan	6.4	<60	<50	9000
4.....Saipan	5.0	<60	<50	1125
5.....Saipan	7.0	120	<50	9000
6.....Saipan	6.2	<60	<50	9000
7.....Saipan	7.0	>480	75	9000
8.....Saipan	7.2	<60	<50	>9000
9.....Tinian	7.0	480	75	9000
10.....Tinian	5.8	<60	<50	3000
11.....Tinian	6.7	120	<50	9000
12.....Tinian	6.9	180	<50	9000
13.....Rota	7.2	60	<50	>9000
14.....Rota	7.2	60	<50	>9000
15.....Rota	6.5	300	<50	9000
16.....Rota	6.3	<60	<50	7000
17.....Rota	6.5	<60	<50	9000
18.....Rota	6.7	60	50	9000
19.....Rota	6.4	<60	<50	7000

^aSamples taken by the author during the course of field work; analyses made by Agricultural Extension Service University of Hawaii.

^bThe location of soil samplings are shown on Figure 75.

TABLE 14
STANDARDS FOR DETERMINING SOIL REQUIREMENTS
(AS USED IN HAWAII)^a

A. The pH Factor					
Very Strongly Acid	Strongly Acid	Slightly Acid	Neutral	Alkaline	
Less than 4.5	4.5 to 5.5	5.5 to 6.8	6.8 to 7.1	7.2 plus	
B. Readily Available Plant Food Per Acre					
	Very Low	Low	Medium	High	Very High
Phosphorus (P ₂ O ₅)	120	180	300	480	plus
Potash (K ₂ O)	50	100	200	300	400
Calcium (CaO)	750	1500	3000	6000	9000

^aSource: Dr. Z. C. Foster, Soil Conservationist, Agricultural Extension Service, University of Hawaii.

Phosphorus is variable on the three islands, but is generally low, as is also nitrogen and phosphate. An 8-8-8 fertilizer is recommended for general use on Tinian and a 10-20-10 one on Saipan and Rota. Exceptions to this are needed in particular cases, as in the area of sample nine (Fig. 75) on Tinian, where phosphorus is high.¹

The physical and chemical characteristics of good soil are difficult to maintain on the calcareous terraces which compose the greater part of the islands' surface. Because of low water-holding capacity and the low absorption of plant nutrients, precaution must be taken in the utilization of commercial fertilizers if the greatest good is to be obtained from the amounts applied. It is evident from Japanese studies of Rota soils that proper fertilization presented a considerable problem to the sugar growers, and that, in

¹The area from which this sample was taken was formerly occupied by a Japanese agricultural experiment station.

spite of much research, no adequate solution was reached. Japanese edaphologists working in Rota in 1938 made the recommendation that silicic acid clays from the andesitic volcanic areas be added to the coralline soils, an expensive procedure which was never attempted by the sugar company.

With the development of any program to provide income for the natives through commercial agriculture, it is essential that coordinated plans be made to maintain the productivity of the soil. Fertility management should give attention to the supply of the following soil elements, with consideration for the regional variations between one area and another as determined by analysis and study.

- (1) Potassium . . . available from . . . farm manure
vegetative waste
potash fertilizers
- (2) Nitrogen . . . available from . . . farm manure
legumes
vegetative waste
nitrogen fertilizers
- (3) Calcium available from . . . lime, especially needed
on the upland terraces
of Saipan.
- (4) Phosphorus . . available from . . . phosphate fertilizers
- (5) Trace salts . . available from . . . fertilizer mixtures
- (6) Humus available from . . . vegetative waste
farm manure
green manure.

With the expansion of coconut planting initiated by Civil Administration, the natives should be educated to the use of coconut husks as fertilizer. The ashes of the husks have been shown to contain 46 per cent salt, 30.7 per cent potash, 4.14 per cent lime and 1.92 per cent phosphoric acid. In many areas the husks are burned for the quick application of the constituents to the soil in the form of ashes, but it is better to bury the husks in trenches in order to add humus to the soil and to prevent loss of valuable materials in burning.

Soil Conservation

The background of the native farmer has not made him alert to the need for soil conservation. His aboriginal farm practices were not highly destructive of the soil, and the foreign administrators who introduced field crops and the plow were not concerned over the consequent effect on the soil. The Japanese customarily brought steep slopes into cane production with a resultant loss of soil that made field abandonment necessary. The Americans, under pressure to supply food for the inhabitants after the invasion, gave little attention to soil waste as they brought fields under cultivation with mechanized equipment. Since the history of land use in the Marianas has not made the

native appreciative of the need for soil conservation, education must be a major part in any program to preserve the soil. The native practice of planting corn up and down hills instead of with the contour requires immediate discouragement. The greatest possible use should be made of cover crops, with which the natives are now unfamiliar, so that fields are protected during periods between the planting of clean-tilled crops. More attention should be given to the maintenance of productivity through fertilization. A minimum use should be made of heavy equipment; if the cooperative use of farm machinery is planned, direction should be given in regard to proper methods of plowing, harrowing, and cultivating. Alerting the native farmer to the need for conservation is probably the most difficult part of the program. Improved methods of soil use must be carried to the islanders through the schools, farmers' meetings, 4-H Clubs, and practical demonstrations giving evidence of the effectiveness and advantages of the recommended techniques. Much can be accomplished through the local extension agent working under the direction of a soil conservationist serving the entire Micronesian area.

Fishing and Associated Problems

The sea is the second major resource, supplying the natives with food and affording possibilities for commercial development. Under the Spanish and the Germans, fishing was primarily subsistent, and little effort was made to place marine products on the market because of the difficulties of transportation. The Japanese developed the industry second in importance to agriculture in supplying exports to Japan. Their boats began to ply the waters of the Marianas before the end of the German regime, and the shores of Garapan harbor became a favorite place for the drying of fish. After the Japanese acquired the islands, small fishing operations were dominant until about 1930 when large-scale activity was initiated. This development was part of a planned fishing program sponsored throughout the Japanese mandate and was based on ten years of intensive research on the character and extent of marine resources in the area. In the Northern Marianas, Garapan became the major fishing center, while Tinian Town was a secondary base. In 1937, the Saipan District held fourth place in fishing among the administrative districts of the mandate, and produced 11 per cent of the total haul made in Japanese Micronesia. No natives were employed in the industry, neither on the boats nor in processing plants, and native fishing continued in its traditional function of providing day-by-day food supply.

Rehabilitation of the fishing industry

American attack on the islands completely wrecked the Japanese fishing industry. All shore installations were destroyed and the boats either sunk in the harbor or beached and destroyed by fire. As a part of the program to place the civilian populace on a subsistence basis as soon as possible after the end of hostilities, the hulls were raised from the lagoon, hauled ashore, and reconstructed by Japanese and Okinawan carpenters. The Japanese engines were replaced with American diesel types, which gave speedier boats repairable with American equipment and parts. Eventually four boats were brought into use on Saipan and Tinian. A fishing base was established at Garapan, Saipan,

and another on the small embayment just north of the harbor area on Tinian.¹ In addition to off-shore fishing, a seine crew operated in the lagoon. All fish caught were distributed to interned civilians. When repatriation of the Japanese nationals left Tinian uninhabited, the base there was abandoned, but on Saipan a cooperative fishing company was organized to engage in commercial activity. Production since rehabilitation has been insignificant as compared with Japanese catches made in the area (Table 15), but the Saipan Fishing Company is distinctive in that it is the largest of the two native ventures in commercial fishing now operating in the Trust Territory.² Alongside the commercial development, which engages only a few people, the majority of the inhabitants continue with their traditional subsistence practices. Families have been slowly replacing their nets and other fishing gear destroyed during the war and have resumed their dependence upon the sea as second to the soil in supplying home food needs.

The contrast between present and past production is as striking as that for agriculture, and indicates the potentialities for future development (Table 15).

Native fishing

Native fishing, which traditionally serves to add fish to the diet four or five times a week and to supply a small surplus for salting or drying, is primarily adapted to inshore conditions. Aboriginal fishing techniques carried to the islands by the original settlers and there modified in relation to the new environment continued in partial use until early Japanese times but have since been either displaced or changed to the extent that machine-made products are used entirely in the making of gear.³ Native fishing practices are well adapted and as productive as western hand methods but involve more labor and time. Fish are caught along the barrier and fringing reefs and from the rocks along the shore, but the lagoons have been the major fishing areas since the time of prehistoric occupancy. Saipan possesses the largest extent of lagoon; the northern portion is regarded as the best for fishing but is the least used because of its distance from Chalan Kanoa, the most populous of the villages. The small and only partially enclosed lagoon on Tinian was deepened by harbor construction during the war. On Rota, barrier reefs

¹Now the site of the Trust Territory Leprosarium. (Fig. 45).

²A native fishing cooperative has also been organized on Truk. U. S. Navy Department, *Handbook on the Trust Territory*, p. 143.

³Two unique methods long continued to be practiced on Rota. One involved the use of a live decoy fish which was tied through the dorsal fin with a long cord. When permitted to swim along the reef, the fish sought out others of the same species. It was then slowly drawn shoreward so that the fish which followed were brought within reach of net or spear. A second method utilized the half-shell of a coconut through which three holes had been bored. The shell was filled with grated coconut, closed with a stone, and dropped in the lagoon at some favorable location so that the coconut oozing from the holes attracted fish.

TABLE 15
POSTWAR AND PREWAR PRODUCTION
OF MARINE PRODUCTS, SAIPAN DISTRICT

	1948 ^a (Tons)	1937 ^b (Tons)
A. Fish		
Bonito.....		4,075.64
Tuna.....		97.99
Mackerel.....		15.98
Mullet.....		.22
Shark.....		6.39
Other fish.....		168.98
Total	89.45	4,365.20
B. Other Marine Products		
Trochus.....	c	
Trepang.....	0.00	24.34
Lobster.....	0.44	
Turtle.....	0.03	
Total	.47	24.34
Grand Total	89.92	4,888.47

^aTabulated from data from U.S. Navy, Civil Administration Unit, Saipan District, Quarterly Reports for the year 1948. Figures are not available for the catch of particular ~~species~~ species.

^bConverted from Japanese data U. S. Navy Department, Office of the Chief of Naval Operations, *The Fishing Industry of the Japanese Mandated Islands*, OPNAV P22-20 (Washington: 1944), p. 2.

^cNo trochi were collected in the Saipan District in 1948. The export in 1949 amounted to about 2 ½ tons.

enclose small lagoons on both sides of the isthmus. That on the north is the largest and the most heavily fished. Since fishing is an adjunct of household industry, almost every family prior to the war possessed nets, spears, and hooks and lines, but at present only an estimated 60 per cent have such equipment. Boys begin to accompany their fathers fishing when about seven or eight years old, and at twelve or fourteen fish in groups with other boys. Fishing is mainly men's work, but women aid in weaving nets, participate in shore fishing, and, among the Carolinians, sometimes take part in seining. Native fishing gives its highest yield in the summer, especially in June, July, and August, when the water is least rough. Early morning before six-thirty, late evening, and cloudy days are regarded as the most favorable times for success because mid-day shadows 'scare the fish.' During the war all native fishing was confined within the reef by Japanese regulation, but, since deep water fishing is regarded as sport and engaged in only occasionally, the ruling evoked no hardship. Native failure to develop open-water fishing is due not to inability but to lack of need to fish beyond the reef to meet subsistence food requirements.

Among the more popular food fish taken in the lagoon are mullet (*laiguan*), mackerel (*atulae*), and snappers (*mafuti*), the catches, however, consist of a wide variety of tropical species. Small silvery fish (*manahag*), up to three inches in length and having the appearance of young herring appear in schools off Rota in May and June and are taken with throw nets. In 1950, they appeared in the lagoon at Saipan. A number of fish are considered poisonous, but not all the natives are in agreement as to which types should be avoided. Varieties mentioned as poisonous include puffers, large crevelle, various red fish, nearly all fish seen along the outer fringes of the reef, and some of the black fish seen inside the lagoon. The natives explain the poisonous character as resulting from the feeding habits of the fish. Other marine products used for food include spiny lobsters and, on Rota, the fleshy parts taken from trochus and cateye shells. Coconut crabs are also eaten.

Use of the throw net (*talaga*) is the most common fishing method in the Marianas, proving efficient along the rocky shores and jagged reefs. Weighted with lead around the edges and varying in diameter from ten to fourteen feet, the nets are from one-quarter inch to one and one-quarter inches in mesh (Fig. 76). From two weeks to two months are required for the manufacture of a net, depending upon size, mesh, and time available for weaving. The nets are valued at from fifty to ninety dollars each, but few are offered for sale because of the shortage since the war. Throw nets are used at night as well as during the usual fishing hours. Fishermen working the reef or shore, especially if fishing for income, usually carry two nets of different mesh; when the net is cast, diving is necessary for retrieval, as there are no strings for closing the net or for recovery. While this seems an inconvenience, in many places draw strings would catch and probably result in damage. Seine nets (*chinchulas*) are utilized in the lagoon on Saipan, but elsewhere the cliffed shores and small stretches of beach with inshore reef restrict their use. These nets are woven in sections about thirty feet long and four or five feet wide, and are combined in lengths up to two hundred yards. The mesh is from one to one and one-half inches. Seines are handled in several ways. The shorter lengths of from ten to thirty yards are operated by groups of from five to fifteen persons. Waders explore the lagoon, moving parallel with the shore, and call ashore to the other members of the party when a school is

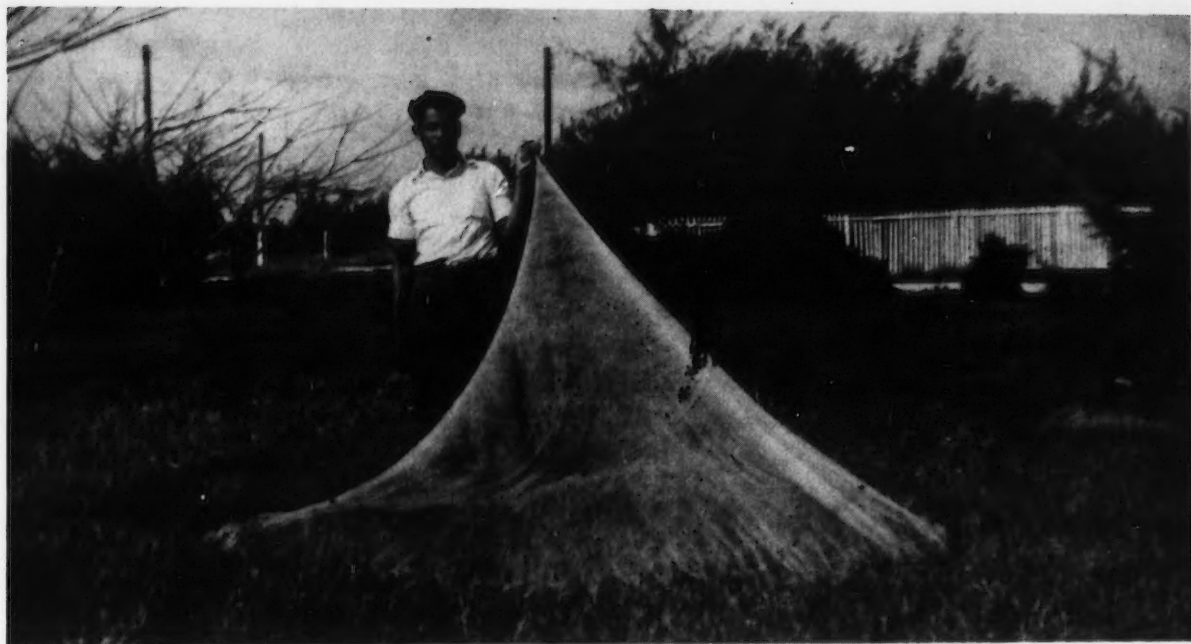


FIG. 76. A fourteen-foot throw net.

sighted. All then wade out single file to a little distance beyond the fish, and, after the net is let down, part of the group carries it landward while the others swim and splash to drive the fish into the net. Native parties sometimes work the beach from Chalan Kanoa to Tanapag in this manner, driving an ox cart along the shore to carry the gear. Longer lengths up to two hundred yards are used with either end attached to a boat propelled by poling or with only one end fastened to a boat and the other end pulled close along the shore by several men. According to the natives, seines of one-inch mesh and from fifty to one hundred yards in length are sometimes set over night by anchorage to coral heads along the reef to serve as gill nets. This method was said to have been learned from the Japanese; none of the fishermen interviewed reported its use since the war. Another net familiar to the islanders is the *bakudan*, a bamboo framework covered with fine netting in such a way as to form a basket-like scoop net. A handle facilitates its use. Reportedly introduced from Yap by the Carolinians, the *bakudan* is apparently not a popular net, for none have been made since American occupation.

Spear fishing by diving, at which the Carolinians are most adept, is a shallow-water activity, often carried on in the lagoon where it is possible to walk with head above water or within swimming distance of such walking conditions (Fig. 77). In deeper areas, as in Garapan Harbor, divers operate from boats. Some fishermen also work from the reef. Ordinarily the divers do not remain under water for more than one and one-half minutes, as the swimming is strenuous and requires considerable physical exertion. Most of the diving is done in depths of less than three fathoms. The spears used vary in length from three to five feet. The barbed point is made from a piece of iron picked up from one of the numerous military dumps and the handle of some light wood



FIG. 77. Carolinian fisherman with spear.

that will float. The divers dress lightly, wearing only swimming trunks, or perhaps, if a Carolinian, a breech cloth, shoes, preferably with rubber soles, and goggles of hard rubber frames set with window-glass lenses. Divers usually fish in groups of two or three so that tries can be made for large fish without possible loss of spear. Most of the fish taken are under a pound in weight. Native informants stated that it is possible for a diver to spear up to twenty pounds an hour if the fish are abundant.

Several other fishing techniques are practiced by the natives. Jab-spearing, a common method along shore and barrier reefs and in shallow pools at low tide, is most extensively practiced on Rota. The same spears may be used for diving and jabbing, but many fishermen prefer one with heavier handle for jabbing, in order to better pin the fish against the rock. Octopi are usually taken by jab-spearing, but are sometimes speared by divers. Several natives stated that octopi can also be captured with a stick thrust into a reef cavity and withdrawn when an octopus is firmly entwined. Hooks, lines, and poles are used infrequently. They are in most common use on Rota, handled by the women, who use worms and small fish for bait and fish along the rocky shores near the village, mostly in the evening. Occasionally a fisherman is seen along the reef or in the lagoon at low tide using a machete to strike at fish stranded in shallow pools. The natives occasionally use a fishing method known as *lalago*, in which they strike the water in a shallow pool with a stick and frighten the fish into crannies, so that they can be caught by hand.

Fish traps (*gigaus*) are not common, as most natives feel that the amount of fish taken does not justify the work of construction. Made of chicken-

fencing and wooden stakes of *tangan-tangan* (*Leucaena glauca*), the traps require two or three days to construct and have a life of four or five months unless the stakes are replaced. The traps are built in a round or clover-leaf pattern, enclose an area about fifteen feet long and twelve feet wide, and have an inner catchment space of five to seven square feet. Long guide fences serve to funnel any fish moving parallel with the shore into the trap. The only traps seen were three or four in the lagoon on Saipan, and, although these were inspected numerous times by the author, no fish were ever observed entrapped. According to native informants, trap fishing was productive until the early Japanese period, after which heavy commercial fishing reduced the fish resources.

Although the natives know the use of poison, they report that it is no longer used because it kills many fish too small to be used for food. Poisoning was prohibited by the Japanese and infractions were punished by fines and imprisonment. No cases of fishing with poison were observed by the writer. Two plants, however, were pointed out as being suitable for such use, *Barringtonia asiatica*, a tree bearing a fruit whose kernel can be crushed for poisoning, and *Derris elliptica*, a trailing vine producing a root suitable for use either fresh or dried. According to the natives, when either is dropped into gaps in the reef, the fish float to the surface and are easily taken by net or spear or with the hands. The drugs do not affect the edibility of the fish.

Catching spiny lobsters, *Panulirus marginatus*, is a popular night sport and supplies a favorite food item. Lobster fishing is a group activity, engaged in by men and boys who work in pairs, taking turns at carrying the light and the sack and spearing or capturing lobsters with the hands. Shallow water, generally under four feet in depth, with a bottom of sand and scattered rocks provides the best lobster grounds. On Saipan, the natives carry Coleman lanterns or sometimes navy battle lanterns, which can be used under water to provide light; but on Rota torches are carried. Mature lobsters vary from eight to twenty inches in length, and weigh up to three pounds. As many as thirty or forty may be taken by a group of six or eight fishermen in as little as one and one-half hours of wading and spearing.

Capture of coconut crabs (*Birgus latro*) is also a popular night sport. The party seeks out a sweet potato field, where the crabs often forage, since coconut palms have been so reduced in number that they provide insufficient food. Moonlight nights are the best for hunting. Flashlights are carried, and sometimes a stick, although the crabs are taken with the hands. Seizing a crab requires considerable dexterity, for their strong, quick-moving claws can easily strip the flesh from a finger or slice off a part of the hand. When more are captured than the family can use, they are tied and hung from the ceiling of the cook house or the lower branches of a tree and kept for three or four days or sometimes they are confined in a box and fattened with coconuts over a period of three or four weeks. Cooked in the same manner as lobsters, they are regarded as a delicacy and sometimes sell for five dollars each, although the usual price is from one and one-half to two dollars.



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Few fishermen use boats. The sea-going outrigger canoe, admired by early western navigators in the Marianas for its speed and construction,¹ has long since disappeared among the Chamorros, who now seldom venture into open water. Two or three possess boats which they use in lagoon fishing. The Carolinians, closer to their native traditions than the Chamorros, made canoes from logs up to about 1930; those which remained in use prior to the war were destroyed during the attack. Due to a shortage of timber, these could not be replaced, and since the war the Carolinians have utilized salvage materials for boat building. The most common adaptation is an aviation auxiliary gas tank cut in half and fitted with an outrigger and sometimes a sail (Fig. 78). With a capacity load of two persons, they operate with safety inside the reef, but are never used outside. The Carolinians, in ancestral pattern, also continue to build sheds along the beach for the storage of boats and fishing gear. These serve as masculine club-houses and are occasionally used by the bachelors as sleeping places.

Fishing presents a number of natural hazards, but while the fishermen tell many stories of dangers, known cases of injuries are few. Snake-like eels are a danger to waders along the shore and reef. Toadfish (*Synanceia thersites*, Seale) with poisonous dorsal spines lurk in the sea weed and when stepped upon cause severe inflammation. Sharks are seen in deep water and occasionally enter the lagoon. To the outsider these dangers appear a constant menace, but to the native, familiar with the shore and the habits of sea creatures, they are a commonplace part of fishing and very seldom lead to injury. Unlike most Micronesians, the Chamorros and the Carolinians report no taboos or superstitions which restrict their fishing activities, except perhaps as some may happen to apply to certain fish which are regarded as unsuitable for use.

Commercial Fishing

Since the war, deep-sea fishing has been commercialized only on Saipan. The native owned and operated Saipan Fishing Company has two powered sampans and two small naval landing craft (Fig. 79) and at times has employed up to seventy-eight men, most of whom were trained by Okinawans before repatriation. Except for directorship, which is Chamorro, the company is entirely Carolinian. The company functions on a plan similar to that of many American firms, buying the fish from the crews who operate and maintain the boats, an earlier plan by which the company assumed all responsibility for maintenance having proved unsuccessful. Due to insufficient crew and lack of repairs, it has been impossible to keep all four boats in operation, and generally only two are in fishing order. Absenteeism has been a major problem; in 1948 the director reported that on some days only twelve to fifteen men appeared for work. The base at Garapan, constructed in major part by Military Government before the repatriation of the Japanese, consists of a dock, a cleaning shed,

¹The natives are very ingenious beyond any people in making boats or proas.... These are built sharp at both ends...about 26 or 28 feet long...and with outlayers...each end of the boat serves as head or stern as they please. The native Indians are no less dextrous in managing than in building these boats.' Dampier, *A New Voyage Around the World*, p. 298.

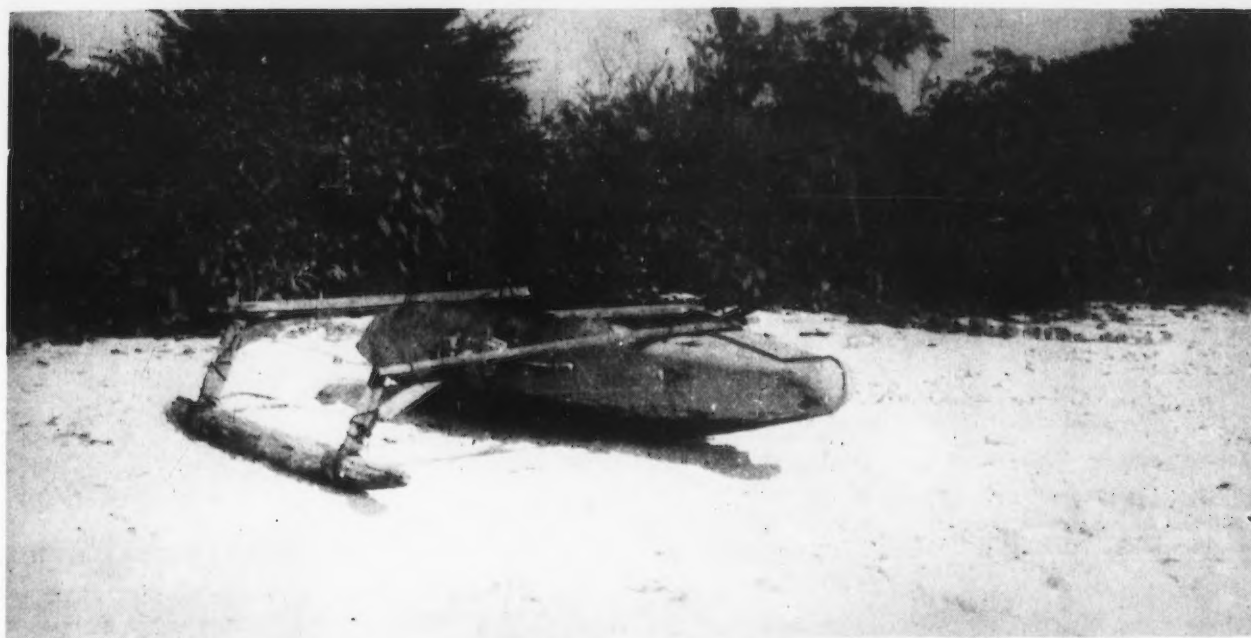


FIG. 78. Outrigger canoe made from aviation auxiliary gas tank.



FIG. 79. Fishing Boat.

an office building, and a refrigeration plant, which was added after the company assumed control. Fish are retailed through the local stores and surplus is exported to Guam. Shipping has presented a problem because of lack of refrigeration. The industry is based primarily on bonito (*Katsuwonus [Euthynnus]*, *pelamis*) which makes up over 80 per cent of the annual catch. Mackerel are seined in the lagoon, especially in March, when runs are heaviest. The shore areas are worked for spiny lobsters; and some tuna are taken in deep-sea trolling. The company also makes trips to the formerly-inhabited northern islands for coconut crabs, copra, and the capture of cattle and goats for slaughtering on Saipan.

Dependent upon weather conditions, which are at their best from the end of February to October, when the northeast trades are least dominant, one or sometimes two company boats leave the base every day. Departure time is customarily set for one or two in the morning, but usually the fishermen do not leave until later, sometimes not until five or six.¹ The cliffed coast of Tinian provides the most abundant supply of bait fish (*Anchovilla purpureus*), but if departure is late bait may be captured off Marpi Point at the north end of Saipan. Approaching the coast, divers go overboard every seventy-five to one hundred feet until a school of anchovies is located. Anchoring the sampan parallel with the shore, two or three lines with hooks on the ends are carried ashore and fastened to the rocks to prevent the boat from drifting. A bait net measuring about thirty by sixty feet and fastened to the side of the boat is unrolled and extended shoreward by swimmers (Fig. 80). Then, while two or three swimmers support the bamboo float at the far edge of the net, others, starting about 30 yards distant, swim towards the net from both sides to drive the anchovies. The net is then pulled towards the boat, and the anchovies are dipped into the bait tanks. Bait not taken by dipping is handpicked as the net is being rolled back into place on the pole carried alongside. The water in the open bait tanks amidship is kept fresh by movement of sea water which enters through several holes bored through the bottom of the boat. Catching bait requires from one to two hours, depending on the roughness of the water and the abundance of fish. If bait is taken at dawn, the water is more likely to be quiet, and the boat can be maneuvered close to the best bait areas at the foot of the cliff. If the fishermen arrive late, the waves are frequently high and bait capture is dangerous because of the rocks. The Carolinians, however, are master swimmers and are apparently fearless in approaching the shore. The swimmers who carry the lines ashore are especially adept, using the force of the waves to lift themselves onto the coral terraces.

After capture of bait, the fishermen cruise in search of bonito. The presence of a school is indicated by sea gulls feeding at the surface, both birds and bonito being attracted by schools of small fish. The best bonito fishing areas are located ten to forty miles offshore north and west of Saipan. Once bonito are located, the sampam maneuvers across the head of the school

¹It was customary for the Okinawan fishermen to secure their bait in the evening, so that they could make an early morning departure and thus take advantage of the best time for fishing. The natives, in contrast, catch bait in the morning and thus delay their arrival at the fishing grounds.



FIG. 80. Extending the bait net.

while bait is thrown out to attract and hold the fish. Since the school moves rapidly, several unsuccessful trials may be made before the boat is in a suitable position and the engine is thrown out of gear. Each fisherman has an assigned place during fishing operations. Two dip bait from the tanks into pails, which are carried fore and aft by two other men, who in turn pass them to three or four throwers. Most of the bait is scattered within ten feet of the boat, and that which remains swims back alongside and is sometimes dipped up and re-thrown. Using bamboo poles about ten feet long, three or four men fish from the stern and from eight to twelve others along the forward gunwale facing the school (Fig. 81). Fishing from a sitting position with legs outboard, the men lean backward when a fish strikes, lifting the fish aboard so that it swings under the left arm for removal of the hook. Barbless feathered hooks are used first and then replaced with hooks requiring baiting as soon as the bonito no longer strike at the jib. Two live anchovies are used in baiting the hooks, the fisherman keeping a reserve supply pressed tightly between his lips. If in operating order, nozzle sprays are used during the fishing, or at least in the early part, as the water striking the surface dissembles the scurrying bait fish at the surface and hides the fishermen. Experienced men can catch from nine to twelve bonito per minute when the run is at its height. Fishing seldom extends much over an hour; in that time twelve to fourteen fishermen may catch as much as four thousand pounds.

Yellowfin tuna (*Neothunnus macropterus*) are occasionally taken by trolling. Usually the bonito fishermen let out a few lines while cruising, and if tuna are encountered more lines are extended. The yellowfin is a fast moving fish, and the crews are not yet efficient in their capture. Long-line methods practiced by the Japanese are not utilized by the natives.



FIG. 81. Fishing for tuna.

Trochus shells (*aliling tolumpo*) of the commercial variety (*Trochus nilotious*), reportedly introduced from Yap by the Japanese, are harvested along the reef on Saipan in the last week of May and the first week of June, the former Japanese season for legal collection. Only shells of three-inch length are taken, and all those with worm borings are rejected. *Trochus* is exported to Guam for commercial handling by the Island Trading Company. The shipment from the Saipan District in 1949 amounted to about two and one-half tons.

Only three or four natives, licensed by Civil Administration, fish individually for income. These men use traditional techniques, especially the throw net, and sell their catch at their homes. They fish inside the reef from three to five days a week, going out early in the morning and returning in the afternoon about three or four. Since the demand of their neighbors outstrips the supply, there is no problem of storage.

Commercial production of marine products in 1948 amounted to 89.45 tons, an amount about equal to 2 per cent of the Japanese total of 4,365.2 tons in 1937. Numerous problems handicap the expansion of the industry, but the possibilities of what could eventually be achieved are indicated by the contrast between the present and past production in the area as shown by Table 15.

Problems of Commercial Fishing

As with agriculture, expansion of fishing on a commercial basis is dependent upon markets and transportation. Guam offers an immediate sales

outlet for more fish than are now being exported from Saipan, but refrigerated shipping is necessary to ensure shipments against spoilage and refusal of entry to Guam, as has occurred. Japan, which formerly absorbed all the fish exports from the Northern Marianas, also has market potentialities. Most of this export was in the form of dried bonito sticks.¹ Since fishing is a major industry in Japan, breaking into the market may arouse opposition from pressure groups, as was the case when Saipan products were first introduced during the Japanese regime.

In contrast to present plans to build up the fishing industry through private efforts, the Japanese subsidized the industry. Cash grants were made to induce Okinawan fishermen to migrate to the Marianas for the purpose of building fishing boats and establishing shore bases. As production increased, companies and associations were formed and operations were extended on an increased scale. In 1937, the subsidy granted to companies in the Marianas amounted to about 11,480 yen (\$3,305.00); this included 2,940 yen (\$846.00) for fishing boats, 4,675 yen (\$1,346.00) for unloading equipment, and 3,865 yen (\$1,113.00) for fishing gear.² While the amount seems small, the grant was made at a time when the industry had reached a fairly high degree of development, in large part due to earlier subsidization.

The native attitude towards fishing is essentially subsistent, and the experience and background necessary for commercial activity is lacking. Several natives expressed an interest in the possibility of admitting a few Okinawans or Japanese to the islands to give instruction in commercial fishing techniques, but any such venture undertaken should not be overestimated as to immediate results. Considerable government assistance and aid would also be required to enable the islanders to build up the industry after the completion of the training period. A similar educational program, initiated with Japanese instructors about 1935 among the Chamorros of Guam, proved generally ineffective in stimulating fishing due to a lack of deep-sea craft and gear available to the natives after the training program was completed.³ A second effort was made on Guam to encourage fishing after World War II when Military Government removed ceiling prices on marine products, assigned individuals trapping rights along shore areas, released men from other labor to fish, and offered the use of naval vessels for deep-sea fishing. This also proved unsuccessful, mainly because of the opportunities for employment at American military installation, and commercial fishing still remains undeveloped on Guam. As of 1946, in spite of an inadequately supplied market with high

¹There is a small, almost undamaged processing plant located near San Jose on Tinian, which could be dismantled for some of the needed equipment if production of fish products for Japan were initiated.

²U. S. Navy Department, *Mandated Marianas Islands*, p. 151.

³Thompson, *Guam and its People*, p. 145.

demand, only 71 of the 25,345 natives of Guam were listed as full-time fishermen.¹ An educational program with aid in establishing the industry should prove more successful in the Northern Marianas, as opportunities for employment have been steadily decreasing with the withdrawal of American personnel. It does not appear likely that any American fishing company would desire to undertake exploitation of the area's resources with the object of training the natives, especially since richer and more easily accessible fishing areas lie closer to the United States, unless sale of produce could be directed toward Far Eastern markets.

The opening of the Trust Territory to Japanese fishing in May, 1950² brought the commercial fishermen of the area into direct competition with skilled crews utilizing efficient boats and gear and thus makes the native need for training, equipment, and government aid the more urgent if the fishing industry is to be developed by local peoples. Since the Japanese are prohibited from approaching closer than three miles of land, it will be necessary for them to operate relatively large vessels. One of the Northern Marianas' basic problems, that of transportation to market, might be solved if permission were granted the Japanese to make Saipan a port of call; thus, some export of locally caught fish as well as vegetables and fruit would be possible. A very small number of Saipanese have expressed approval of a plan whereby the Japanese would be permitted to establish a fishing base on the island and employ and train natives on the fishing boats and in the processing plant, with the understanding that the capital investment should eventually be repaid and the industry come under local control. The majority of the people, however, are suspicious of any move which would bring the Japanese back to the islands. An agreement made with the Japanese should be specifically worded and strictly enforced for the protection of the natives.

Labor would be a problem in any immediate large development of commercial fishing whether conducted with outside capital or locally with government aid. As of 1936, the Japanese industry in the area employed 609 persons, or about one and one-half per cent of the total population,³ and operated 35

¹U. S. Navy Department, *Information on Guam Transmitted to the United Nations*, p. 25.

²Opened upon the recommendation of General Douglas MacArthur and approved by Admiral Arthur W. Radford, High Commissioner of the Trust Territory. The ruling permits the Japanese to fish in approximately three million square miles of ocean area from which they have been restricted since World War II. *Honolulu Star Bulletin*, May 19, 1950, p. 6.

³Japanese Government, *General Information on the Saipan Branch of the Japanese South Seas Bureau*, (about 1937), trans., Headquarters of the Commander-in-Chief, U. S. Pacific Fleet and Pacific Ocean Areas (Pearl Harbor; CINCPAC, 1946), p. 6. (Typewritten).

powered fishing vessels, 64 non-powered boats, and 12 dried-bonito factories.¹ It should be noted that the number of people employed in fishing in 1936 is equal to almost half the present effective population in the area. However, the four fishing boats now owned by the Saipan Fishing Company, if kept in running order and manned with an adequate well-trained crew, can easily be supplied with labor from present population numbers, and could serve as a nucleus for an expanding industry as population increases.

The shortage of bait resulting from environmental conditions presents a problem which formerly limited expansion of commercial fishing under the Japanese. Shore conditions are not ideal for bait fish; the coasts are steep-to, affording little protection for small fish; and there is an absence of streams bringing down food from inland areas. Capture of bait is difficult in the months from October to February, as rough weather frequently makes it impossible to let down the bait nets alongside the cliffed shores. Smith, who surveyed the marine resources of the former mandated islands for U.S.C.C., suggested that it might be possible to use small goat fish from the lagoons for bonito bait instead of anchovies.² Because of the bait handicap, the Japanese experimented with purse seines for bonito about 1920 but were unsuccessful.³ It might be well to repeat this experiment to determine if some successful method might be developed with the purse seine for taking bonito without bait. This involves numerous difficulties because of the transparency of the water, and the speed at which bonito travel, but possibly the technique might prove successful at night.⁴

Keeping the present reconditioned boats in running order is a major problem for the Saipan Fishing Company, since machine parts are difficult to obtain and the crews generally inexperienced in maintenance. Consequently, considerable fishing time is lost due to mechanical failure of the boats. For efficient fishing operations, the boats should be able to stay out overnight if no fish are taken during the day; but because of the condition of the boats, it is necessary to require that all vessels return to the dock at least by seven in the evening; otherwise a search is instituted. All the boats now in operation will undoubtedly require replacement in a few years. On a basis of the recommendations made by Smith following his survey of Micronesian fishing in 1946, the native needs a fishing 'vessel on the order of

¹Japanese Government, Saipan Branch Administrative Office, *Descriptive Outline of Saipan*, p. 50.

²Robert O. Smith, *Survey of the Fisheries of the Former Japanese Mandated Islands*, Fishery Leaflet No. 273, Fish and Wildlife Service. (Washington: Department of the Interior, 1947), p. 69.

³*Ibid.*, p. 68.

⁴Robert O. Smith, *Survey of the Fisheries of the Former Japanese Mandated Islands*, Fishery Leaflet No. 273, Fish and Wildlife Service (Washington: Department of the Interior, 1947), p. 68.

the Japanese sampam...powered with a similar type engine, modified to operate on....50 cetane diesel fuel.' The present boats 'cannot be replaced with military vessels because of unsuitability, high cost of purchase, lack of maintenance facilities (including parts), and cost of operation and maintenance.'¹

While refrigerated storage space is available at the fishing base, there are no facilities for the manufacture of ice for use in the shipment of fish to Guam or to furnish a supply for the fishing boats. If provision could be made for insulated, iced storage on each of the fishing vessels, the fishermen could remain out all day when only a small catch is made in the morning.

Plans to expand fishing commercially would require scientific investigation to determine the character and extent of marine resources, the biology and ecology of aquatic life in the area, and the best means of production for income. Much work of this nature was accomplished by the Japanese at the Marine Resources Experimental Station at Koror in the Palaus but was destroyed during the war. Some has been uncovered in Japan by the Natural Resources Section of the Supreme Command Allied Powers (S.C.A.P.), and other materials are being translated in Honolulu by the Fish and Wildlife Service of the United States Department of the Interior. Abstract and applied research cannot be supported, at least at present, from within the area. Funds for this work under the Japanese were supplied directly by the Imperial Government. Any staff appointed for research should include personnel able to provide practical leadership in deep-sea fishing, processing of marine products, and marketing, so that the islanders can eventually be trained to a level which will enable them to compete with the Japanese fishing in the area. Scientific research might also discover fish resources of value for derivatives such as amino-acids, oils, and vitamins; but these by-products are dependent upon large catches. Sea plants afford other opportunities for derivatives. Any by-products sold in the United States, however, would come into direct competition with small American industries initiated during the war when fish and sea weed derivatives were not available from Japan, the world's major producer.

One of the marine resources in the area not utilized since the war is the sea cucumber. They are abundant along the shores and reefs; three varieties were noted, varying in length from twelve to twenty inches. Prior to hostilities, the Saipan District was one of the Micronesian centers for the collection and processing of trepang or *beche-de-mer*, but none of the natives are familiar with the five- to ten-day process by which the slugs are boiled, cleaned, and dried. Processing requires care to command the highest market price, for the Chinese, who are the sole consumers, are particular as to quality. The former trepang export from the Northern Marianas was shipped to China and in part re-exported to Hawaii and the United States. Finding an American dealer who would handle the product might give some difficulty, as the product is imported directly by small retailers and is an unfamiliar item on the American wholesale market.

¹Smith, *Survey of the Fisheries of the Former Japanese Mandated Islands*, p. 83.

Problems of Subsistence Fishing

Since subsistence fishing is of major importance to the natives, every effort should be made to preserve the marine resources in order to maintain a source of home food supply. The conservation laws established by the Japanese should be continued or revised as needed. On Saipan, the lagoon, especially from Chalan Kanoa to Garapan Harbor, was overfished during the war and in the period immediately following. Because of the heavy demand for protein food, even the smallest fish were taken, and large fish are now few. Since the area is easily accessible from the present village of Chalan Kanoa, it continues to be the major fishing center. Moreover, according to native informants, the lagoon on Saipan was fished with dynamite by the Japanese during the war, and by American soldiers with hand grenades after the invasion. Whether the ecological balance in the lagoon will adjust itself to its former fish population without control is open to some question, even though the number of people fishing is now considerably smaller than in the Japanese period. The area should be investigated by a marine ecologist and recommendations made which will insure a continuous supply of fish for subsistence use. No particular advantages would be gained by an attempt to change the native fishing methods, but it is essential that supplies of materials for the manufacture of gear be available to the islanders. The shortage is not so acute on Saipan, where many of the islanders have had income from employment at American installations, but the people of Tinian and Rota have not had this advantage.

Summary

While commercial fishing has been rehabilitated on a small basis, greater expansion to raise local income gives rise to problems which will require considerable time to solve. The subsistent attitude of the native toward fishing, together with the lack of capital, the inexperience of the people, and the problems of markets and transportation are handicaps which hamper commercial expansion of the industry. If it is desired to develop fishing entirely through native enterprise, the services of the United States Fish and Wildlife Service should be extended to the area to conduct basic research and provide practical leadership. Financial support from the government will be necessary to establish the industry on a firm basis. With sufficient aid, the present small company on Saipan might be made the nucleus for an expanding industry correlated with population growth. An alternative to the development of the industry by the native lies in the possibility of exploitation of the marine resources by outside capital, with full provision for the protection of native interests. Since lack of experienced labor imposes a problem here, it would be necessary to bring skilled fishermen from outside until such time as native crewmen might be trained to meet the needed qualifications for employment.

Forestry and Associated Problems

The forests of Saipan, Tinian, and Rota are small in extent and poor in quality. The tree cover, which remained a dominant feature of the landscape throughout the German regime, was quickly stripped away when the

Japanese settled the area, leaving trees only along the cliffs and on the steeper slopes and poorer soils. These areas were heavily tapped for timber and for wood for fuel and charcoal. On Saipan and Tinian, trees of timber size are now exceptional, but on Rota, which has a higher percentage of shallow rocky soil and was late in being drawn into Japanese plans for development, the wooded areas are of more value for lumber. Approximately 5 per cent of Saipan, 2 per cent of Tinian and 25 per cent of Rota is forested. No cutting has taken place since American occupation. Wood for fuel and building has not been a problem on either Saipan or Tinian because of the scattered waste of war and the abandonment of wooden military structures. Rota has been handicapped by a lack of building materials because of a paucity of salvage and problems of local milling, but essential supplies were brought in from Tinian. The future, however, holds problems of wood supply unless measures are taken toward reforestation.

Local Woods

Ifil (*Intsia bijuga*), the most prized of the Mariana timbers, has been so depleted that the Japanese controlled its cutting. The hard inelastic wood, cross-grained and difficult to work, is resistant to dampness and insect attacks and serves as durable material for house supports and floors. As the wood ages, it so increases in hardness that nails cannot be driven into it without holes first being bored. Yellowish-red when fresh cut, *ifil* gradually takes on a dark color resembling black walnut. When used for floors or furniture, the natives give the wood a high polish by rubbing it with grated coconut wrapped in porous cloth. Other woods used for building include *ahgao* (*Premna gaudichaudii*), a hard wood resistant to rot and insects, used for house posts, flooring, and walls, although knotty and oftentimes crooked; *dack* (*Calophyllum inophyllum*), a hard wood used for both inside and outside lumber and once used for canoes; *chopag* (*Ochrocarpus excelsus*), used for ceilings; and *dogdog* and *lemai*, the seeded and seedless varieties of breadfruit (*Artocarpus communis*), a soft wood, not highly regarded, but used for interior construction purposes.¹

The Forest in Native Economy

As alien land systems were imposed, the natives were gradually shut away from the forest areas which had played a major part in their early economy, supplying timbers for houses and canoes, wood, bark, and fibers for arts and crafts, and fruits, roots, and plants for food and medicine. The Spanish may have imposed some measure of control on free native use of the forest in Guam, but it is unlikely that any restrictions were placed upon the natives who resettled the Northern Marianas. Nor was any effort made to abolish the destructive practice of firing the grasslands to provide fresh grass for cattle and to drive deer into the open when hunting. Burning, which damages the forest margins and extends the grass areas, was prohibited when the Germans assumed administrative control of the islands. At the same time, all land not utilized by the natives for agriculture or grazing became government property. The woodlands were open to the natives for gathering fuel and for the collection of foods and handicraft materials, but no forest areas could

¹See Appendix A for other constructional timbers.

be cleared, grazed, or cut for timber without government permission. This was granted on a basis of need. After the Japanese established their rule, the government lands were settled by the Japanese colonists. Within a few years, cultivated land came to predominate over forest, the natives were restricted from all woodland which they did not hold in private ownership, and lumber became an article of commerce.

Japanese Forestry

The Japanese colonists were primarily concerned with bringing the land under cultivation; government subsidies were offered for clearing, and the forest was stripped away as an impediment to agriculture. Within twenty years this policy resulted in a shortage of wood for building and fuel and made necessary the importation of lumber and small quantities of coal for industrial purposes. In 1936 a study of the remaining reserves was made by the Tropical Industries Research Institute and recommendations made for conservation and reforestation. Since the primary timber need was for fuel for the sugar and tapioca factories, for the narrow-gauge railway, and for charcoal for domestic consumption, quick-growing trees, such as ironwood (*Casuarina equisetifolia*) and Formosan Koa (*Acacia confusa*), were planted in the upland areas, on shallow soils along the cliffs, on the steeper slopes, along beach ridges, and in windbreaks. Ironwood was set in the swordgrass areas on the upland ridges of Saipan, but the plantings were not successful. Examination of these areas indicated that fire was probably the greatest hazard to successful reforestation, although drought may also have been a factor. Elsewhere plantings were successful, and, with the meager remaining forest resources supported a small forestry industry which in 1937 engaged 217 persons, all Japanese nationals. Production of forest products in Saipan District in 1937 amounted to 21,446.1 cubic feet of lumber and 777.141 tons of charcoal.¹ Some of this was probably obtained from the islands north of Saipan.

Forestry Since American Occupation

No forest cutting has occurred since American occupation. A small native-owned mill operates on Rota using scattered logs, mainly *ifil*, which were cut by the Japanese and left lying in the forest when the war interrupted lumbering (Fig. 82). Production of saw timber is insignificant; the mill owner lacks both transportation to bring in the logs and gasoline to operate the engine which powers the saw. To date, no forest regulations have been enacted by the government of the Trust Territory. It is expected that conservation and forestry rulings will soon be formulated on a basis of recommendations made by conservationists now in the field.

Forestry Problems

With protection, the natural processes of ecological succession will gradually result in reforestation of some of the now unused areas. Along some of the forest margins *Leucaena glauca* is vigorously invading abandoned fields, producing heavy stands that shade out other plants on the floor.

¹U. S. Navy Department, *Mandated Marianas Islands*, p. 147.



FIG. 82. Rota: Sawmill.

Casuarina equisetifolia is successfully reseeded in some localities on Saipan and Tinian, and *Tramna orientalis* is making a strong stand on Tinian. Fire is the greatest single danger to this natural advance. Although illegal, burning has been difficult to control. Natural reforestation, even with proper conservation, will not, however, keep pace with the forest needs of the area without planting of further reserves.

Because of the lack of pressure on the land, the present is opportune for reforestation, particularly over those areas not well suited to agriculture. Funds for planting on a large scale are not available from within the area, but much could be accomplished through 4-H Clubs, the schools, and community cooperation. Rota, with its more extensive forest area, would provide an abundance of seedlings. The islanders recognize the need for renewing their timber resources, but their thinking is in terms of future lumber supply rather than of regarding the forest as an indispensable resource also of importance in checking erosion and conserving the water supply. Any community planting would require consideration of the future status of forest ownership and the conditions under which timber would be made available to the islanders to avoid exploitation for private profit. The opinion is current that the volcanic area now covered with swordgrass will not support forest, but it appears more likely that fire rather than edaphic factors have kept these areas treeless. Reforestation of these areas would perhaps require considerable experimentation with various species before a stand could be established. The native farmers should be encouraged to plant timber trees along their property lines and on farm areas not suitable for cultivation. A demonstration woodlot, established by 4-H Clubs or the schools and coordinated with an educational program, should do much to further conservation through practical demonstration.

Fundamental to the success of any forestry program is the making of preliminary studies of the edaphic, climatic, and biological factors involved in forest growth in the Marianas, the physical characteristics of the local woods, and the timber needs of the people, so that the present forests can be managed and new plantings made on a practical and economic basis. Because of the small areal extent of the islands, the expansive character of the population, and the cost of transportation to market, it does not appear that the Marianas are geographically suitable for commercial timber production. Planning should be primarily adapted to native wood needs for fuel, building, and handicraft. Mixed stands will meet the situation and probably produce the best growth. Since the subtropical forest is a mixture of numerous species, it may well be that the health and vigor of the entire organic complex are dependent upon variety and the ecological contribution of each tree to the whole. Mixed plantings would also reduce the hazard of forest destruction by little-understood tropical diseases and insects which might wipe out solid stands. Such plantings would likewise require less attention by trained foresters, who are not likely to be made available to the area. In a mixed forest, it would undoubtedly be possible to include a predominance of the more desirable trees, either local or introduced, based on the technical reports from laboratory testing of various woods for quality and resistance. With adequate planning, reforestation can serve a multiple use, providing timber, checking erosion, preserving the watersheds, and supplying pasture under controlled conditions.

Mining and Associated Problems

The limited and low quality mineral deposits of the Northern Marianas were little exploited until the Japanese period. While the occurrence of guano on the northernmost islands was known to the Spanish, the deposits were left untouched throughout the entire period of their rule. The Germans showed no interest in the deposits until they were illicitly tapped by the Japanese. German control followed, but Japanese labor was used in mining, and the entire output was shipped to Japan. The small quantities of guano noted by the Germans on Rota remained unused until the Japanese acquired the islands; the supplies were then quickly exhausted and have not been renewed because of the near extinction of the cave bat from which the deposits originated. Phosphate was discovered by the Germans on Saipan, but the deposits were considered too small for exploitation. In 1935, the surveys of the South Seas Development Company showed that the deposits on Saipan were greater than had originally been supposed, and that phosphate was also present on Rota and Tinian. Mining was initiated on Rota in 1937 and on Saipan in 1938. In 1939, the total export from the Saipan District amounted to 70,785.5 tons.¹ Small manganese deposits on Saipan and Rota were also brought into production. Mining continued up until the American attack on the islands, although submarine warfare seriously curtailed the shipment of ores. All mining installations on Saipan were destroyed during the invasion, and those on Rota were ruined by bombing.

¹U. S. Navy Department, *Mandated Marianas*, p. 146.

Phosphate

Phosphate, the most important mineral mined in the Saipan District, occurs in surface deposits on the elevated terraces. According to Aso, the Marianas' phosphate had its origin from guano laid down by sea birds in nesting areas adjacent to the sea.¹ Heavy precipitation leached the deposits of nitrates and organic matter and the remaining material reacted with the calcium carbonate of the underlying limestone to form rock phosphate. Later elevated to their present position, the deposits were covered with soil materials and long remained undiscovered. The mineral occurs in smooth-sided cylindrical cavities pitting the coral limestone. In some instances, the pits have coalesced, forming cavities up to twelve feet across, but the majority are from three to five feet in diameter and ten to twelve feet deep (Fig. 83).

Phosphate mining was most extensive on Rota, where the deposits, originally estimated to have amounted to 300,000 tons, underlay an area of 245 acres on the high southern plateau (Fig. 42). An area of approximately 82 acres of concentrated mineral was first mined, after which operations were extended into deposits of poorer grade. Mark, who investigated the site in 1946, estimated that from 58 to 69 acres remained unmined, with approximately 50,000 tons of low-grade reserves in the ground.² Because of high aluminum and iron content, phosphate from the Marianas sold at a low price on the Japanese market. In 1937, flotation experiments were conducted to improve the quality of the Rota product in order to obtain a higher market price;³ drying, however, was the only form of processing prior to World War II.⁴

Phosphate was mined entirely by hand methods. The pockets of mineral were discovered by prodding with iron rods, and the phosphate was removed with shovels and a tool resembling a post-hole digger. On Rota, narrow-gauge rail lines were laid down in the mining area, and the ore was transported in side-dump mine cars to an aerial tramway which connected with the drying and storage plant at Terunon on the southern coast of the island (Fig. 42). A loading bridge extended over the cliffed shore, and a conveyor transported the phosphate from the plant to lighters for loading in cargo ships. Bombing

¹Yawata Aso, *Phosphates* (Tokyo: Maruzen Co., 1940) as cited by William D. Mark, 'Phosphate and Manganese Ore Deposits on Rota, M. I.,' (Report to the U. S. Commercial Company, Honolulu, 1946), p. 4. (Typewritten).

²William D. Mark, 'Phosphate and Manganese Ore Deposits on Rota, M. I.,' (Report to the U. S. Commercial Company, Honolulu, 1946), pp. 5-6. (Typewritten).

³Toyokichi Ichihara, 'Investigation and Report on Rota Water Selection Phosphate,' (Research Report to the South Seas Development Company, 1938, translation by Military Government, Saipan, 1945), p. 1. (Typewritten).

⁴Mark, 'Phosphate and Manganese Ore Deposits on Rota,' p. 9.

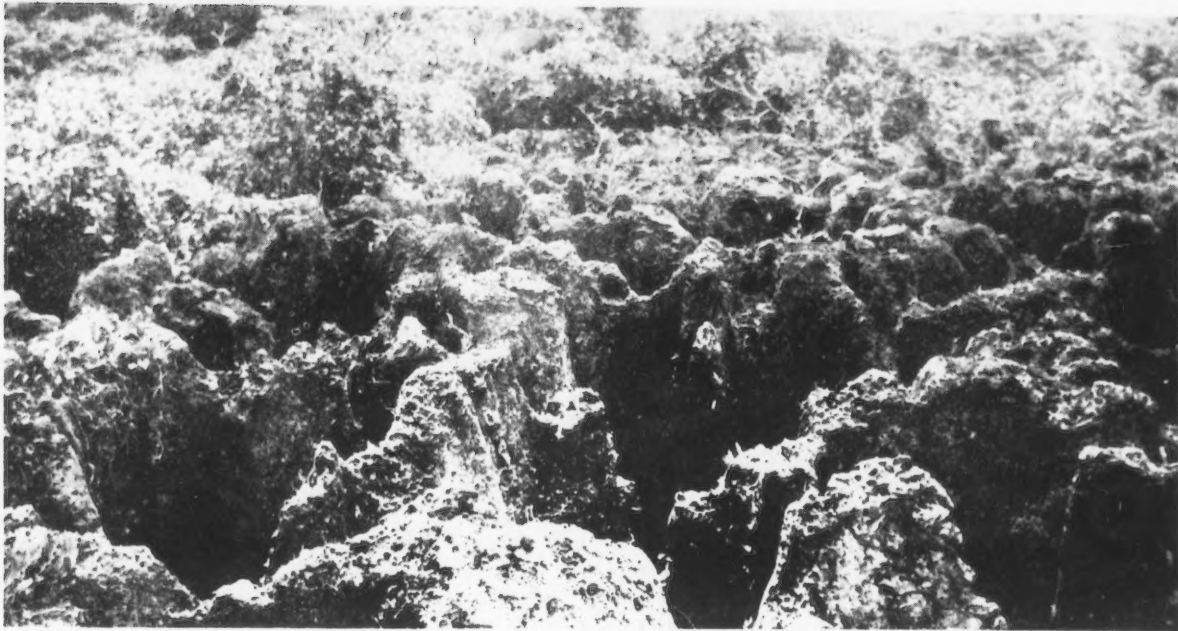


FIG. 83. Pitted surface after phosphate mining.

destroyed the plant and the small workers' village adjacent, but the aerial tramway still remains although the buckets were removed for water storage when the island's inhabitants sought refuge from air raids in caves and wooded areas. Installations were less elaborate on Saipan. The deposits occurred in an area of about 980,000 square yards located on the northern terrace of the island (Fig. 84). Japanese production on Saipan in 1939 amounted to 22,794¹ tons as compared with 43,439 tons on Rota.²

No evidence of mining was noted on Tinian during the course of field work, although Aso estimated the presence of 2,600 tons of 30 per cent grade phosphate and 6,000 tons of 25 per cent grade phosphate.³ Since mining would have left the surface pitted and entirely unusable for agriculture or grazing (Fig. 83), the Japanese may have decided that it was more profitable to leave the land in crop production rather than to mine such small amounts. The

¹U. S. Navy, *Mandated Marianas*, p. 146.

²Mark, 'Phosphate and Manganese Ore Deposits on Rota,' p. 6.

³'Translation of Extracts from a book by Yawata Aso,' (Prepared by Far East Section, Central Intelligence Group, Washington, 1946), p. 4. (Typewritten).

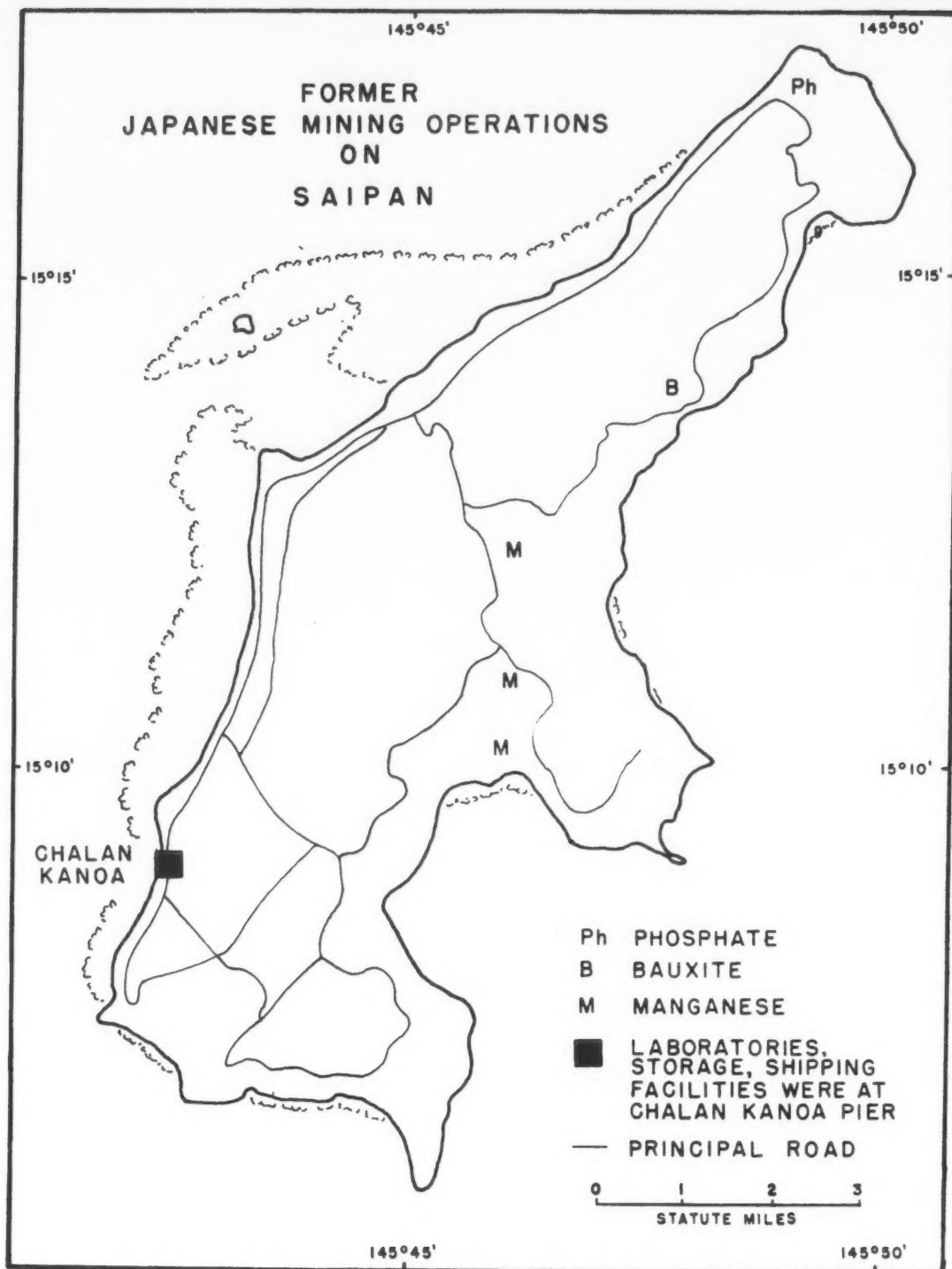


FIG. 84

mentioned deposits were stated by Aso to be located near Lion Rock, at Shiminato, and in Marpo; the location of these sites could not be accurately determined.¹

Manganese

Manganese mining was most extensive on Saipan, the deposits occurring on Kagman Peninsula along the line of contact between coralline and volcanic rock (Fig. 84). Most of the mines were open pit or tunnel, but a few shafts were sunk along the main line of the vein in some of the valleys. All operations were small scale; the ore was hand-picked and carried to the portal in baskets or carts except in two or three of the larger mines which were equipped with small tramways and hand-pushed cars. Shipment of ore was from Chalan Kanoa, where a small sampling laboratory was maintained. No figures are available as to the amount of exports. One small manganese deposit was worked on Rota. Native informants stated that from ten to fourteen persons were employed at the mine. The deposit was investigated by Mark, who stated that the

"probable prospects for establishing a small mining industry on Rota are not sufficiently promising to warrant the purchase of the equipment required or the training of natives to do such work."²

Bauxite

The bauxite discovered on Saipan through the surveys of the South Seas Development Company was never brought into production. Exploratory cuts were being made at the site of the deposits at the time of the American invasion (Fig. 84). According to Civil Administration officials on Saipan, the deposits have been examined and evaluated as too small for profitable mining. Apparently the mining operations were initiated by the Japanese because of wartime pressure for metals.

Summary

The small extent of the known mineral deposits in the Northern Marianas restricts resumption of mining on a profitable basis. Investment in equipment

¹One of the curious results of the war was an almost complete loss of place names on Tinian making difficult the location of sites mentioned in source materials. In occupying the island, the Americans designated all locations in terms of the military branches installed at the newly established installations. These names went out of use with the withdrawal of American troops, and the Japanese names were lost when the civilians were repatriated. Detailed Japanese maps of the island have not been found. Most of the native names have also been lost, as the Japanese removed the Chamorro and Carolinian residents when they assumed administration.

²William D. Mark, *Report on the Mineral Deposits of Micronesia*, Vol. III, *An Economic Survey of Micronesia*, (Honolulu: U. S. Commercial Company, 1948) p. 24 (Transcript, Library of Congress Microfilm).

and the training of the natives to conduct operations does not warrant commercial exploitation according to investigations of the deposits by geologists and mining engineers. The phosphate is of a type which can be applied directly to the soil,¹ and could perhaps be mined by simple methods and used locally for fertilizer. Since the phosphate is of low grade, it is probably more feasible to conserve the land for agriculture and grazing rather than to render it useless by mining operations.

Handicraft and Associated Problems

Under the impact of foreign cultures, the aboriginal arts and crafts of the Chamorros have become obsolete. Some skills were lost and others were transferred and modified to the use of new materials and the making of adopted forms. Since change was most rapid in the Japanese period, many of the older men and women still possess knowledge of raw materials formerly taken from the forest and the techniques used in the manufacture of needed household and occupational equipment. While handicraft is at a minimum in the Northern Marianas as compared with some of the other Trust Territory areas, especially the Marshalls, every household has members experienced in carpentry and wood-working, sewing, and the making of fishing gear. This knowledge was an important factor in the rehabilitation following the destruction of homes during the war and was utilized by American administrators in the work of reconstruction.

Handicraft in the Rehabilitation Program

As the populace was placed on a subsistence basis following the close of hostilities in the Marianas, handicraft was established as an organized activity among the civilian internees on Saipan to produce souvenir items for sale to American troops. This project, initiated by the Economic Division of Military Government and later continued under U.S.C.C., was conducted by groups of workers who managed all phases of production while American supervisors established policy, retailed the produce through military outlets, and imported needed raw materials not available in the island area. The venture proved an immediate success, demand exceeded supply, and sales ran as high as four or five thousand dollars a month. Production followed ethnic and sex lines; Chamorro and Carolinian workmen wove baskets and mats, Carolinian women made *lava-laps*,² Chamorro and Carolinian men engaged in wood carving, Carolinian men made models of outrigger canoes, a few Chamorro men worked with silver and shells, the Japanese manufactured dolls and coconut shell articles, and all groups worked with string, weaving belts, doilies, and handbags.

¹Memorandum from William D. Mark, mining Engineer to Douglas L. Oliver, Special Representative of U. S. Commercial Company, Honolulu, 'The Suitability of Rota Phosphate for Direct Application to Soils,' June 12, 1946.

²See page 199.

In May, 1946, after the repatriation of Japanese nationals, the native workers reorganized as the Saipan Handicraft Association, shares were sold at five dollars each, and about two hundred persons became members. Many of these were able to contribute only part time to the activity, as they had obtained employment at American installations; nevertheless, production remained high. The reorganized group encountered a declining market of changing character. The small inflow of wives and children of American military and civilian personnel did not compensate for the loss incurred because of the steady withdrawal of troops. Demand for souvenir items decreased and buyers now sought utilitarian articles for use in homes. Attempts, on the part of American officials to channel production into the making of more varied and practical items failed, as did also plans to improve quality by importing products from other Micronesian areas to serve as examples of better workmanship. For a time it was hoped that a coordinated handicraft project could be conducted throughout the Trust Territory with production of items for retail in the United States, but the plan failed because of the difficulties of securing enough articles of high quality. As the Saipan market declined and no outside market opened, only highly skilled work sold; in consequence discouragement spread, the native association leaders were severely criticized, and the handicraft organization disbanded in 1947. The retail shops at the military centers were closed, and the association outlet in Chalan Kanoa, established when the natives reorganized in 1946, passed into private ownership. A number of workers expressed the intention of operating on a private basis, by either opening shops or selling through the Chalan Kanoa store. Two groups of silver workers were successful in establishing small businesses. This success was due to a number of factors; the number of silversmiths was small, not more than ten or twelve; jewelry items were not overproduced; the work was of fairly high quality; and the market continued strong. For a time, makers of other handicraft continued to sell their products through the private craft shop, but difficulties arose over price, the middleman's profit, and the demands for high quality. Eventually so little work came to be produced that the store was obliged to import articles from the Carolines and the Marshalls and from China and Japan. At present, the manufacture of handicraft for commercial sale has almost ceased except for a very limited production on a person-to-person basis.

Problems of Handicraft as a Commercial Activity

An analysis of the potentialities of arts and crafts as a source of income shows limited promise for only a small group of highly skilled workers. Some of the problems involved arise from the local situation and others are inherent in the nature of handicraft itself. Commercialization and quantity production are contrary to the function of handicraft in native society. Articles are customarily made as needed, either for home or group use. In some cases persons skilled in the making of a particular item may produce articles on request in exchange for goods or services, or certain families or social groups may retain the knowledge of production from one generation to another and supply the needs of the entire community. The most highly skilled work is accomplished when the native knows who is to use the finished product and has a desire to favor and please the individual requesting the item. The finished article may then be presented as a gift, but with the expectation of something in return. Making many articles merely because they will sell has little appeal and tends to result in poor workmanship. On Saipan, this careless attitude towards quality in quantity production has been increased by the

early success of the handicraft program under the Americans, when practically all articles sold regardless of lack of skill in manufacture.

Experience in commercial handicraft is lacking in the Northern Marianas. The venture initiated on Saipan under American leadership was the first effort ever made in the area to organize production on a commercial scale. Arts and crafts were taught in the native schools under the Japanese, but no attempt was made to stimulate manufacture for retail trade as was done in some of the other island groups, as for example in the Marshalls. On Saipan and Rota, a few of the more highly skilled artisans produced a limited quantity of work on a spare-time basis. Most of this manufacture was done on order, largely as a personal favor, and only occasionally were items taken to the stores, where payment was withheld until sale was made. Most of the persons who engaged in handicraft under the Japanese took an active part in the American program, and with direction and further training they might be made the nucleus of a small producing group if retail outlets could be opened.

The number of handicraft articles suitable for commercial development now made in the Northern Marianas is limited, and both variety and improved quality would be needed to meet standards on American markets. Articles now familiar to the natives which offer the greatest potentialities for sale are baskets and mats, *lava-laps*, and silver-and-shell jewelry. None of these is particularly distinctive in terms of native design, and with the exception of jewelry, all are available at lower prices in the Marshalls.

Native Handicraft

Pandanus baskets and mats are the most frequently made craftwork, although neither serves a significant function in native life. Baskets are made to be sold, and very seldom is a native seen carrying one. The usual Chamorro and Carolinian basket is box-like in shape, the top folding inward from all sides and closing with a button and loop clasp. (Fig. 85). Shape and pattern of weave are relatively standardized, and more variety would be needed for successful development. Mats have a more common use; they are spread on the floor for sleeping when members of the family, especially the children, lack beds; they are also sometimes used for floor covering. Weaving is essentially women's work, although the men are acquainted with the techniques and sometimes lend assistance. While the general procedures are the same for all weavers, each worker tends to develop individual ways of handling the materials, and a certain amount of traditional lore exists as to the best methods to be used. Some gather the leaves, particularly those which are to be bleached, only in the morning and evening to avoid drying by the noonday sun, while others gather throughout the day. Leaves for unbleached work are selected according to varying degrees of brownness. Only the narrow-leafed variety of the pandanus or screwpine is used. If the leaves are to be used unbleached, processing consists of drying in the sun, stripping away the scabrous edges, and softening each leaf by passing a spoon or knife along its length several times. The pandanus is then rolled to stretch the leaf. After three or four days, the leaves are unrolled, the ends are braided together and the strands dried in the sun for about two weeks. When thoroughly cured, the strands are cut into strips for weaving. If the pandanus is to be bleached, so that it can be dyed, the leaves are gathered green and boiled for half an hour to remove the natural coloring, after which dye is added. Processing is



FIG. 85. Weaving baskets.

then the same as with unbleached pandanus. Chamorro and Carolinian baskets are of double thickness; a broad weave is used for the inner lining and a fine weave of varied pattern for the outside. Some workers use boxes as frames to support and mold the basket during the weaving process. The weakest parts of the baskets are the handles and clasps, and commercial production would require experimentation to strengthen and improve these parts. The floor mats made have less commercial appeal than the baskets. Attractively woven table mats could easily be produced, but would have to bear competition with similar products from several other tropical areas.

The *lava-lap*, a loom-woven, wrap-around skirt formerly worn by Carolinian women, has now almost completely lost its traditional function and has come to be used as a table scarf or a wall hanging. Originally made of coconut fibers or grasses in an approximate size of eight by two and one-half feet, it is now made in varying lengths and widths from colored cotton string so woven as to produce a horizontally striped pattern. *Lava-laps* are expensive items in terms of labor costs; the standardized original size requires from thirty to forty hours to complete. In traditional form, the *lava-lap* has little commercial value, attracting only the collector interested in Pacific handicraft, but the skills utilized in weaving could be directed to the making of table mats, women's purses, and wall hangings.

The manufacture of jewelry from silver and shell is an acquired Chamorro art of possible Spanish origin. The craft is practiced by family groups and passed from father to son and to close relatives. Two shops were in operation in 1947; the work produced was largely made to order, often from designs submitted by the customer. Bracelets, ear rings, and finger rings, set with

tortoise shell or cat-eye shell, comprise the greater part of the items produced. The work is of medium price, generally of simple design, and suitable for costume jewelry. All needed raw materials are imported. Because of the small output, any outlet other than the stores of Guam is not feasible at present.

Studies of handicraft on a commercial scale indicate that the main factors for success are lacking in the Northern Marianas. Arts and crafts have their major sale through outlets selling to tourists visiting or traveling through the area of manufacture. The item of purchase serves as a souvenir and holds a significance for the purchaser other than that arising from the usefulness or beauty of the object. If transportation and accommodations were available to enable Americans from Guam to visit the Northern Marianas,¹ a selling situation would be created, at least on a small scale, for the sale of handiwork. The second best sales outlet has been found to be through exhibits at fairs, bazaars, and church functions, with persons from the area of manufacture displaying the goods, selling articles, and taking orders. Gift shops serve as only fair outlets because they generally make necessary considerable boost in price to cover high overhead and small turnover of stock. Most department stores have been found generally unsuitable because of the problem of obtaining enough handicraft to make the venture profitable.

The market for handicraft is decidedly limited. The goods produced have small appeal to the majority and are of high price because of the large amount of time and hand labor involved in production. As a result, most handmade products have their best sale on what might be termed a luxury market. If possible, any handicraft stimulated in the Marianas should be of a non-competitive type, that is, of such character and quality and appealing to such a market that price does not enter as a major factor in its sale. Except perhaps for jewelry, no product from the area comes within this category. Both variety and improvement in the articles now produced are needed if handicraft production is to be expanded commercially, for scarcely any of the present items could compete on the American market. Since only very limited quantities of quality products could be secured from the Saipan District at present, possible retail outlets in Guam at the airport and in stores patronized by Americans are probably the only feasible solution to the problem of finding a market.

Because of the semi-artistic nature of handicraft, there is much variation in quality between the produce of the good artisan and that of the ordinary worker. As a result, in every handicraft group one or two workers or businessmen make a fair profit, but the return to the average worker is low in relation to the time and energy expended.² If the goods are of types

¹Many Americans on Guam expressed a desire to visit the northern islands while they were in the Marianas area. Saipan has much to offer visitors: wide safe beaches, a golf course, and historic sites linked with World War II. It is easily accessible from Guam; the flight between the two islands requires about forty minutes.

²Very few studies have been made of per capita income derived from handicraft. Fairbank, surveying the situation in the United States in 1933, found that 'the return to the best and most skillful artisans.... is around \$400 to \$600 a year. The average competent worker can hope for about \$150 to \$200 annually from handicraft under good conditions. For the poorer workers, the return will run from this down to.... starvation wages of ten or fifteen cents for the whole day's work.' (Nathaniel K. Fairbank, *Handicraft, An Investigation of the Present and Potential Market for Non-competitive Handicraft in the United States* (Washington: Federal Emergency Relief Administration, Division of Self-Help Cooperatives, 1934) p. 3).

which compete with machine products, the financial returns are apt to be negligible. In only a few cases can handicraft be developed as full-time activity, and then generally for only a small number of people. In such areas as Japan or the Hercynian and Alpine regions of Europe, where handicraft is of major importance in adding to the support of the people, most of the workers devote only spare time to arts and crafts and spend the greater part of their energies in some other economic activity.

Because of the need for improvement of products, handicraft in the Northern Marianas could probably be developed only under close supervision in work shops, as home industry would undoubtedly result in the production of much unsalable work. The capital investments for such shops would be small, but because of former discouragement and the disbandment of the handicraft association, support from the natives might not be readily given. Most of the organized handicraft groups in the United States are aided either by the state or federal government or by private philanthropy.

In relation to present handicraft needs, the local resources used in production are more than sufficient. Any expansion of the industry, however, would require studies of the pandanus in order to determine the best types of leaves for weaving, with perhaps further plantings of desired varieties.

Summary

Survey of handicraft during field work in the Marianas and research on the subject in the preparation of this study leads the author to believe that arts and crafts have decidedly limited possibilities in the area, but could be expanded to support a small group of natives on a full-time basis and to supplement the income of some of the others, depending upon solution of the many problems of improvement of quality and of marketing.

Conservation and Associated Problems

The historic background of the islanders has not made them conscious of the need for thrift in the utilization of natural resources. The primitive practices by which the aborigines met their daily needs were destructive, but did not deplete the resources to a critical degree. Over a period of years, nature renewed the exhausted soils in the fields abandoned in shifting agriculture, while the total annual catch made in hunting and fishing was not so excessive as to destroy the sources of supply. Economic life remained primarily subsistent under the Spanish and the Germans. Because of the small population, destructive practices introduced under foreign administration, as for example the careless use of the plow and the indiscriminate burning of grass-lands, did not reduce the resources to such a point that support of the inhabitants was affected. It was not until the Japanese colonized the islands and highly commercialized the exploitation of resources, that the natural supplies of forest and sea products were reduced or disappeared. At the same time, the rise in native income made possible the purchase of items formerly obtained from local resources, so that while the islanders noted the depletions in their environment, their standard of living was higher than it had been previously. The commercial activities of the Japanese and the destruction resulting from the war has made conservation a necessity in the Northern

Marianas, but the natives are not attune to the need. As a result, education must be a major part in any program to preserve the remaining resources.

Japanese interests in the Northern Marianas were at first concerned with the settlement of the area and the quick exploitation of resources. For the most part, little consideration was given to conservation until resources lost their first productiveness. In the late Japanese regime, much work was done with soils, particularly in relation to sugar-cane production, by the South Seas Development Company and the government agricultural experiment stations. Efforts were also made to aid the native in preserving the fertility of farm lands through fertilization. Forestry regulations were enacted and after 1938 reforestation projects were initiated. Commercial fishing, both deep-sea and on-shore, was strictly controlled. No restrictions were placed upon native fishing until 1938, when licenses were made mandatory and the use of poison was forbidden.

Conservation has been recognized as an important factor for consideration by Civil Administration throughout the Trust Territory. While conservation as such was not specifically mentioned in the first directives issued by the Trust Territory Government nor in the provisions for interim government, the various administrative branches have followed the principle that the 'indiscriminate exploitation of the meager natural resources of the area is to be avoided.'¹ A staff conservationist has been appointed to serve in the Trust Territory; conferences have been held in Honolulu and Washington under the auspices of the Pacific Science Board and the Navy to propose recommendations and formulate programs for the Territory; and scientists, alert to the needs of conservation, have been sent into the field.

For Civil Administration, conservation has been one of many perplexing problems for which neither adequate staff nor funds have been available. A long-range policy has been accepted in principle, but it has not been possible to follow it with immediate implementation. Nor are means likely to be available in the near future to meet the many problems involved. Because of this, it is important that administrators entering the area be conservation conscious and fully alert to the needs of the islands, so that every possible advantage can be taken which will aid in preserving the resources. The support of the islanders must be enlisted through classes in conservation in the schools, through the church and its societies, and through practical demonstrations. No program will prove effective if it rests only upon law, although protective measures should be enacted.

Many of the aspects of conservation have already been discussed in the preceding sections, but some elements remain which should receive attention.

Ground-Water Resources

According to theories advanced by Ghyben and Herzberg,² fresh ground

¹'Directive Op22/djh, Serial 1422P22,' Chief of Naval Operations to High Commissioner of the Trust Territory of the Pacific Islands regarding government of the Trust Territory of the Pacific Islands, January 18, 1948. U. S. Navy Department, *Handbook on the Trust Territory*, p. 240.

²C. K. Wentworth, 'Factors in the Behavior of Ground Water in a Ghyben-Herzberg System,' *Pacific Science*, I, (1947) pp. 172-184.

water along coasts and on islands is supported by sea water in a balance maintained in relation to the specific gravities of the two waters. On coralline islands, rain falling on the surface moves downward and builds up a fresh-water lens which floats on the heavier sea water that has penetrated the previous island base. Under ideal conditions, the fresh-water lens descends forty feet below sea level for each foot above sea level.¹ When coralline layers overlie a relatively conformable, impervious base, fresh water occurs in hydrostatic balance along the coast but inland extends downward to the impermeable floor. Geologically, Saipan, Tinian, and Rota consist of pervious coral over essentially impermeable andesitic lava and agglomerate; but faulting has resulted in disconformity, which bars the free movement of ground water and creates various ground-water conditions from one structural area to another. Thus water occurs in three situations: (1) basal water floating on salt water a few inches to a few feet above mean sea level; (2) artesian water in counterbalance with salt water; (3) high-level water perched in pervious rocks by underlying impermeable beds. Withdrawal of water in equilibrium with sea water, if to excess, will result in penetration of sea water and a brackish water supply, while excessive pumping of perched waters depletes the supply. Thus, in the island areas, conservation is needed to ensure constant water supply and to prevent pumping in excess of the amount of water added by rainfall.

Until American occupation, the inhabitants of Saipan, Tinian, and Rota were in major part dependent upon rain catchment for fresh-water supply. Traditional methods of trapping water as it drained down the trunks of coconut palms and of storing it in hallow logs, bamboo tubes, and pottery utensils continued through the German period, except on farms located near contact lines between coralline and volcanic rocks, where water was available from springs and small streams. Elsewhere the supply of fresh surface-water is restricted by the long dry season, the lack of permanent streams, and the turbidity of the water in the intermittent streams during the rainy season. Wells were dug after the coming of the Spanish, but most of these were in the vicinity of the lowland villages and yielded brackish water. Cisterns were built during both the Spanish and German periods but did not become common among the natives until the Japanese government offered subsidies for their construction. The water supplies developed by the Japanese were primarily for industrial and, later, military purposes, and distribution to the civilian populace was minor. After American occupancy the need for water for troops stationed on Saipan and Tinian led to extensive prospecting and drilling by American engineers who followed the landing with special equipment. Water is at present supplied to most of the villages on Saipan and Tinian by American military pumping stations. On Rota, the village of Songsong is supplied with water under natural pressure through the former Japanese piping system linked with springs in the upper levels of the volcanic area on the south-east coast.

Studies have not been made of the full effect of heavy withdrawals upon ground-water reserves during the period of greatest troop concentration on

¹Arthur W. Piper, *Water Resources of Guam and the Ex-Japanese Mandated Islands of the Western Pacific*, Vol. IV, *An Economic Survey of Micronesia*, (Honolulu: United States Commercial Company, 1948), (unpublished - Library of Congress microfilm), p. 7.

Saipan and Tinian. Engineers associated with water supply on Saipan felt that the reserves will remain permanent if pumping continues at the present rate (1948). On Saipan, seasonal fluctuations occur in the supply from springs and Maui type wells, but no variation has been noted in the deep wells. The engineers on Saipan were in agreement in the belief that water was not available in sufficient quantities for irrigation.

The ground-water reserves should be regarded as a resource to be maintained by a balance between inflow and withdrawal. Under a usual climatic year, approximately 181,000 gallons of water fall on each acre of land on Saipan, Tinian, and Rota. Much of this is lost by run-off, by evaporation under high temperatures and steady winds, and by absorption by plants. A part filters through the coralline surface and enters the sea. The portion which eventually enters the water reserve is unknown because of lack of hydrologic studies for the area. It is axiomatic that any constructive measure which will increase the amount of the infiltration of rain water is desirable. This is in large part a problem to be solved through land management so that the vegetation cover is balanced with the total area of each island in such a way as to retard run-off and ensure sufficient infiltration. At present, insufficient data has been collected to provide a basis for such planning. Information is needed on the microscopic rainfall patterns over the islands, the extent of runoff, changes in water levels at sources of supply, and variations in salinity. Funds are not available to carry out this needed research program to its fullest extent, but if equipment were available, it might be possible to obtain at least some of the needed basic data through Civil Administration officials and local water-supply engineers.

Wild Life and Flora

If the limited wildlife of the Northern Marianas is to be preserved, efforts must be made to safeguard habitats as well as to prohibit killing. The Marianas deer, now almost extinct on Saipan and Rota and probably no longer to be found on Tinian because of the reduction of habitat, should be fully protected and all shooting made illegal for a number of years. The fruit bat and the birds which are used by the natives as food, can be saved only if rulings are enacted controlling the rate at which they are taken. The number permitted to be captured annually should be adjusted to the producing capacity of the islands as determined through studies made by an ecologist. Mayr indicates fifteen species of birds endemic to the Marianas, the loss of which would represent a disappearance for the entire world.¹ Survival of the Marianas Mallard (*Anas ousteleti*) requires complete protection against shooting and the taking of eggs and birds for study. The mallard, which inhabits lagoons and fresh-water ponds and marshes, is reported at present only on Saipan, Tinian, and Guam.² Its numbers are now believed to be reduced to as few as fifty individuals.³ It is recommended that exotic species not be introduced to the islands without careful ecological study;

¹Ernst Mayr, 'Pacific Conservation Problems with Special Reference to Island Faunas,' *Conservation in Micronesia*, compiled by Harold J. Coolidge (Washington: National Research Council, 1948), p. 80.

²Yoshimaro Yamashina, 'Notes on the Marianas Mallard,' *Pacific Science*, Vol. II (1948), pp. 121-122.

³Ernst Mayr, 'Bird Conservation Problems in the Southwest Pacific,' *Audubon Magazine*, Sept.-October, 1945, p. 252.

this will prevent undue competition between native and introduced forms and reduce the possibility of introducing diseases which might destroy the local varieties. The habits of the iguana (*Varanus indicus*) and its place in the island environment should be studied; it is now killed upon every opportunity by the natives because of its destruction of chickens. Other protective measures needed for the conservation of bird life include the control of rats and of cats escaped to wild life during the war. Control of fire is also essential; as stated by Holt, Staff Conservationist for the Trust Territory, the greatest single hazard not only to wildlife but also to 'soils, vegetation, ground water, and the long-term well-being of the peoples of the Trust Territory is the indiscriminate burning of vegetation.'¹

The island floras contain some species which are extinct in continental areas and others which are peculiar to the islands themselves. These should be protected, not only to prevent their disappearance, but also because some may have value yet unknown. Many of the island plants are used by the natives for medicinal purposes; these should be studied in order to determine their curative value. If left undisturbed and protected from fire, much of the vegetation will gradually replace itself. Certain areas, however, should be set aside to ensure the security needed for natural growth and replenishment and to provide parks for the scientific study of wildlife and flora.

Suggested areas for reservation on Saipan include Lake Susupe and its adjacent marshes, the upper slopes and peak of Mt. Tapotchau, and Marpi Cliff and Peak at the Northern end of the island (Fig. 8). The marsh and lake area of Hagoi on Tinian should be made a reservation, and also the entire island of Aguijan off the southeastern coast of Tinian (Fig. 70). On Rota, Tapingot Rock, the forested ledges bordering the southern edge of the Southern Plateau, and the wooded cliffs fringing the northeastern coast, (Fig. 7). The vegetation in these three areas is the least disturbed of any seen during field work.

Archaeological and Historical Sites

Every effort should be made to preserve the archaeological sites and historical monuments of the area, not only because of their scientific interest but also for the future enjoyment of the peoples of the Marianas. Digging or restoration should not be permitted except by qualified persons. Markers should designate all areas desired for preservation and carry warnings against destruction. With explanation of the reasons for safeguarding the ruins, the local communities might be made responsible for keeping the sites clear to prevent damage by tree growth. Supervision, however, would be necessary by Civil Administration.

Most of the *latte* on Saipan and Tinian have been destroyed by the agricultural operations of the Japanese. Constructed by the ancient Chamorros, the *latte* consist of double rows of stone pillars supposedly used as supports for houses and canoe sheds. (Fig. 86). Fortunately, the largest and most

¹Ernest G. Holt, 'Conservation Program for the Trust Territory of the Pacific Islands,' (Report presented at the Conference on Conservation in Micronesia held in Honolulu under the auspices of the Pacific Science Board, May, 1950), p. 2 (mimeographed).



FIG. 86. Tinian: *Latte* at the landing place on Tinian as seen by Anson in 1742. Note double row of pillars believed to have served as supports for houses and canoe sheds. Tinian was uninhabited at the time of Anson's visit. The site shown was later occupied by the native village of Taga and then by Tinian Town (Fig. 21).

remarkable of these ruins known in the Marianas, 'The House of Taga' on Tinian, was preserved by the Japanese and escaped damage during the American assault (Fig. 87). The *latte* on Rota, while small, are more numerous and disturbed to less degree than those which remain on Saipan and Tinian, and so offer favorable opportunity for archaeological study (Fig. 88). There is also a prehistoric quarry on Rota located about one and one-half miles east of former Shinaparu village (Fig. 89). Several large pillars and capstones cut from limestone remained unmoved. A native informant reported a large *latte* with pillars 'like those of Tinian' south of the quarry, but this was not discovered. Also not discovered during the course of field work but later reported by Father Marcian, then the Catholic priest on the island, is an unusual ruin described by Fritze in 1901 as consisting of one row of six *latte* pillars in typical position with a wall containing openings on the opposite side.¹ This ruin is located on the seacliffs to the northeast of the airfield.²

Among the historical monuments which should escape destruction are the Spanish church tower and the statue of a local Japanese philanthropist on the

¹G. Fritz, 'Bericht über die Insel Rota,' *Mitteilungen aus den Deutsch Schutzgebieten*, Vol. XIV (1901), p. 203.

²The author was unable to obtain information as to its exact location.

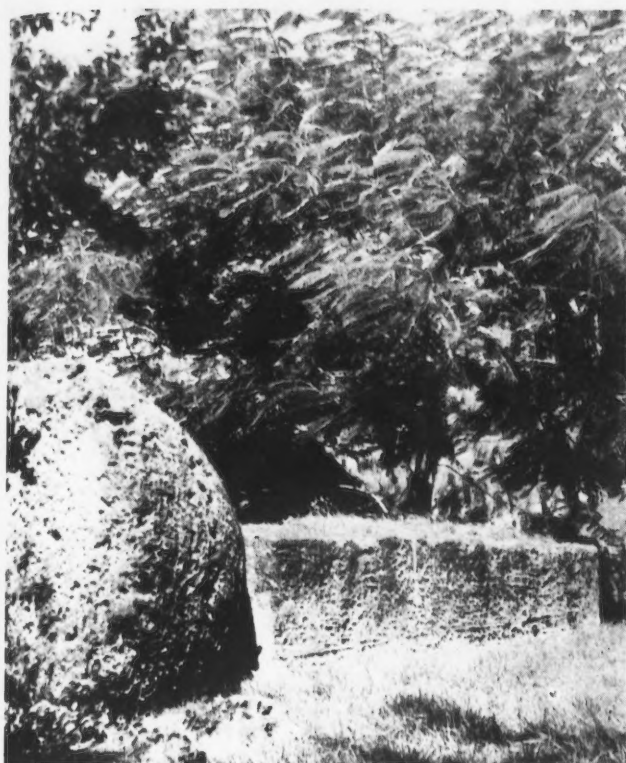


FIG. 87. Tinian: Fallen *latte* at 'House of Taga.'
Each pillar with capstone in sixteen feet in length.



FIG. 88. Rota: Small *latte*.



FIG. 89. Rota: *Latte* pillar and capstone in prehistoric quarry.

site of former Garapan; two small Japanese shrines on Tinian; and the small chapel built by the Germans on the Mission Farm on Rota. It may be desirable to set aside areas on Saipan in commemoration of the battles of World War II fought on the island or in honor of American lives lost in the assault on the islands. These areas should be clearly delimited and designated by temporary signs until such time as the Battle Monuments Commission may decide to erect permanent memorials. It is suggested that the Commission seek to set aside some of the natural areas recommended for preservation on the islands; these would provide living memorials for the conservation and scientific study of the wildlife and flora of the Marianas.

CHAPTER V

The Outlook - Summary and Recommendations

There remains the question of what the future holds for the Marianas. The area fills no particular economic need for the United States. Nevertheless, we have assumed a responsibility in the islands in return for strategic advantages. We have assigned ourselves the task of instituting 'a sound program for the economic development of trade, industry, and agriculture along lines which will ensure that the profits and benefits thereof accrue to the natives'¹ with the objective of 'establishing standards of living for the local inhabitants at least equal to those existing prior to the war.'²

In order not to underestimate the problem, it is well to survey the factors which complicate attainment of the prewar standard:

(1) The reduction in capital, labor, and general economic activity resulting from the war: a destruction of homes, villages, and tools of production so complete as to be almost total; the cessation of all commercial activity for almost a year; the absolute loss of markets; the termination of all commercial transport; the entire displacement of population; and the removal of seven-eighths of the former populace.

(2) The relatively high prewar standard of living, which it is now desired to reestablish: a standard which, while low according to American values, was among the highest of any of the native peoples in the former Japanese mandate; a standard which can be supported only by commercial activity; and one which resulted largely from the presence of the Japanese rather than from the enterprise of the natives. Also, as a result of contact with the Americans, the natives now desire a higher standard of living and public welfare than that maintained before the war.

(3) The meager resource base upon which reconstruction must be established: a resource base limited in areal extent, in quantity, and in quality, consisting primarily of the soil and the adjacent sea, and of microscopic significance in comparison with world totals.

(4) The subsistent attitude and limited commercial experience of the people as a group: an attitude which, because of historic background, regards the soil and the sea primarily as a source of home food supply, and an experience which has never included the direction of commercial activity or the sale of products on a world market.

¹Admiral Louis Denfield, Directive Op22/djh, Serial 1422P22, Chief of Naval Operations to High Commissioner of the Trust Territory, January 15, 1948, appended to U. S. Navy Department, *Handbook on the Trust Territory*, p. 239.

²Quoted from a letter from the Chief of Naval Operations to the High Commissioner of the Trust Territory of the Pacific Islands, April, 1947, as given in U. S. Navy Department, *Handbook on the Trust Territory*, p. 128.

(5) The steady decrease of the local market for labor and produce through withdrawal of American military and civilian personnel: a decrease which has terminated many native activities and reduced the total income.

In summary of the situation, the United States government is committed to aid the native population reestablish their standard of living in an area so devastated by war as to require almost complete redevelopment, and with a population limited in effective numbers and lacking the essential knowledge necessary to go forward alone in the utilization of resources in order to reach the commercial level which formerly supported their standards. Thus the Saipan District is now at a point at which, with its limited resources and inexperienced people, the trend will be to revert to subsistent living unless aid is given.

How much aid should be given to the peoples of the Northern Marianas? There appears to be no reasonable basis for the subsidization of any activity except that necessary to the reestablishment of accepted standards of native living and the military security of the area. The entire problem of subsidy raises questions which are not answered by social and economic statistics. What amount of paternalism is wise socially, and what amount economically? When does aid become a gift, and when does it remain a feasible investment in the orderly and planned development of a region? In general, study of colonial administration indicates that the best procedure is to help the native help himself. An economic system based on subsidies, which are likely to be variable and transitory, gives a less firm foundation for public and private welfare than a system supported by local initiative in the utilization of local resources. The Northern Marianas, however, lack both the capital and the experience needed to initiate commercial activity on a scale which will support their prewar standards.

In view of the present needs of the area as described and analyzed in the preceding pages, it is recommended:

(1) That, since the Marianas arc possesses areal homogeneity of landscape, is occupied by a common people, and has similar problems of reconstruction, every effort should be made to reestablish the regionality of the island group by joining Guam and the Saipan District into a single administrative district, so as to unite the Chamorro people, provide a broader resource base for the support of public welfare, make possible the development of the area as a unified geographic region, and reduce the costs of administration.

(2) That resettlement of the now unoccupied islands in the Mariana arc should be discouraged until the people increase in number, as the scattering of the present small population increases the problems of administration, limits the supply of public services, and spreads the available labor force over too wide an area for the effective development of the land.

(3) That the armed forces determine their land needs as soon as possible so that the extent of area available for native use is definitely known and can be used as a basis for regional planning.

(4) That Congress appropriate funds for the organization of a land claims commission in the Northern Marianas to carry forward the work of surveying the

land and clearing titles. The present confusion of titles is delaying agricultural development as the farmers feel insecure upon the land. Also a land tax, which is needed for the support of public services, cannot be instituted until the land problem is settled.

(5) That Congress enact legislation reorganizing the Island Trading Company of Micronesia so that, in cooperation with Civil Administration, capital and direction can be provided to develop the local resources by the introduction of commercial crops, the expansion of local and foreign trade, the development of fishing, and the establishment of needed transportation, with the intended purpose that all activities shall pass into native ownership and management when feasible.

(6) That, if aid in stimulating commercial activity is not forthcoming through reorganization of the Island Trading Company of Micronesia, outside capital should be induced to establish buying and processing facilities in the area for the purchase and manufacture of produce from native activities. While this may be labeled exploitation, the term 'exploit' has come to take on an ugly meaning not necessarily inherent in the definition of the word. Under control, 'exploitation' would afford the natives a market for produce and labor and further the economy of the area without the necessity of alien acquisition of native lands. Following the war, many of the natives, especially those on Saipan where American personnel provided markets, were opposed to this recommendation; however, since the almost complete withdrawal of troops and civilians, they recognize the advantages to be gained if control is maintained.

(7) That United States Department of Agriculture extension service be extended to the area to work in cooperation with Civil Administration for the improvement of farming, soil management, and animal husbandry, and for experimentation with tropical crops, livestock, and poultry, and insect and plant disease control.

(8) That the needs and potentialities of markets be studied, both in the United States and in the Far East, for the sale of products which can be suitably produced in the Marianas.

(9) That, since the Marianas have no particular advantages over competing areas of tropical agriculture and at the same time possess several disadvantages inherent in the geography and present population of the area and the relatively high wage rate, every effort should be made to produce exports of high value in small bulk to withstand the cost of transportation and to achieve efficiency of production and high quality of product, so as to command a market and offset some of the handicaps of the area.

(10) That, since finished products involve less economic risk on the market and command a higher price than crude agricultural produce, every effort should be made to carry processing as far as possible within the area. This may make necessary the repeal of the 15 per cent ad valorem processing

tax¹ now in effect, in order to remove restrictive measures against such projects. In particular this tax should be removed against the manufacture of coconut oil in order to stimulate its processing from the copra which is now the primary export from the area.

(11) That subsistence agriculture be maintained and improved along with introduced commercial activity as an insurance against depressions, the damage of typhoons, and loss of markets due to war or political upheaval.

(12) That native agriculture continue to be maintained on small, individually owned and operated farms compatible in size with native methods of production and that commercial crops be introduced into this pattern.

(13) That, since the natives are more familiar with the cultivation of fruits and vegetables than any other commercial crop, production of truck be expanded to send more regular supplies to the military and civilian market on Guam.

(14) That subsistent agriculture be maintained and improved along with introduced commercial activity as an insurance against depressions, the damage of typhoons, and loss of markets due to war or political upheaval.

(15) That the work of the United States Fish and Wildlife Service be extended to the area to conduct research on the character and extent of the marine resources and to provide practical leadership for the natives in the development of the fishing industry.

(16) That Japanese and Okinawan fishermen be permitted to enter the area to train the natives in commercial fishing and the processing of sea foods only if funds are not available to finance a branch of the United States Fish and Wildlife Service in the area.

(17) That dependable interisland transportation be established, either by subsidization of the present private lines enabling them to operate on schedule without pay loads, or through native cooperative associations operating vessels obtained as surplus from the Navy or Maritime Commission so that marketable produce can be carried to the Guam market without spoilage.

(18) That, since phosphate mining operations will render the land useless for agriculture or grazing, no attempt be made to exploit the remaining low quality deposits.

(19) That, since neither funds nor personnel are likely to be made available to the Saipan District for reforestation, an effort be made through the

¹The Marianas as a part of the Trust Territory are subject to a processing tax of 15 per cent ad valorem on all articles manufactured or processed within the area for sale or export with the following exceptions: (1) articles for use as human food; (2) articles produced by an individual personally (as opposed to a corporation) and sold by that individual to a consumer without aid of any employee, partner, or associate other than members of his own family; (3) articles mined, and (4) articles subject to Trust Territory internal revenue taxes, such as those covered by the 25 per cent ad valorem on cosmetics, face powders, and perfumes, 20 per cent per carton on cigarettes, 20 per cent ad valorem on cigars and other tobaccos. U. S. Navy Department, *Information on the Trust Territory to the United Nations*, p. 25.

schools, church societies, and community association to initiate small annual projects for the planting of trees.

(20) That an effort be made to obtain a retail outlet on Guam for handicraft produced by the few skilled craftsmen in the Northern Marianas, but that no large scale handicraft program be initiated until such time as the market has been thoroughly explored by the Island Trading Company of Micronesia.

(21) That a program be initiated to educate the natives in the value of conservation, and the need for proper land management and thrift in the utilization of the limited resources of the islands.

(22) That a search be made in Japan to uncover and assemble materials pertaining to the former Japanese Mandate which will provide information of value in meeting the present problems of reconstruction, and perhaps make unnecessary the redoing of much basic research known to have been accomplished by agricultural experiment stations, the Tropical Industries Research Institute, the Marine Products Experiment Station, the commercial companies, and visiting scientists in the area.

(23) That an advisory committee of qualified persons be appointed to aid and assist Civil Administration in the over-all problems of planning and reconstruction throughout the Trust Territory. This committee should consist of representatives from geography, anthropology, economics, agriculture, fishing and other needed fields of research in order to give consideration to the problems of the area as related to the total areal complex, physical, social, and economic.

It is very doubtful if the prewar standard of living and public welfare can be reestablished and maintained without continuous subsidy. The Northern Marianas have not been self-supporting throughout the greater part of their history under foreign rule. Under the Spanish, annual funds for the support of the government were received until 1855. These were discontinued, not because of a lack of need for subsidy in the area, but because of financial difficulties within the Spanish Empire. German expenditure in the Northern Marianas was greater than government income. Economic independence was most nearly achieved under the Japanese; had the war not interrupted the Japanese program, there is a possibility that the islands might have become self-supporting. This, however, does not seem likely as subsidies were granted annually after the area was fully developed under a sugar-producing economy.

Solution of the many problems associated with the resettlement of the native people in the Northern Marianas will require a long period of time. The present population is too small to utilize the area to the extent needed to restore the prewar standards and too inexperienced to push forward without aid and direction. The small amount of funds which have been made available to Civil Administration have made it necessary to follow a very limited program. Under ideal conditions, the area should be surveyed by cooperating social and physical scientists, and plans made for orderly development of the resources through subsidization. As in many American communities, however, a need may be obvious but the funds lacking for fulfillment, making it necessary to accomplish as much as possible with as little as possible. It is therefore essential that the administrators serving in the area be alert to every possible avenue of land utilization which will aid recovery and make the inhabitants more secure upon the land.

APPENDIX A

Typhoons and Tropical Storms Affecting the Marianas, 1944 Through 1949*

As defined by the Fleet Weather Central, Guam, and the Navy Typhoon Tracking Center, San Francisco, a typhoon is a tropical cyclonic storm with winds in the center in excess of 65 knots. Tropical storms are of less intensity but of sufficient strength to cause damage to trees and buildings. The following tropical cyclonic storms were recorded in the years 1944 through 1949.

1944

There is no record of any destructive tropical storm or typhoon affecting occupied islands of the group.

1945

13 September - The center of a tropical storm passed close to Rota, moving west.

1 October - A tropical storm formed to the northwest of Saipan and moved off to the west.

5 October - The center of a tropical storm passed close to Tinian on a northwesterly track.

1946

30 March - A typhoon passed about 100 miles south of Guam on a westerly track.

11-12 July - A tropical storm passed about 100 miles south southwest of Guam on a northwesterly track.

23-24 July - A tropical storm passed near Alamagan on a northwesterly track.

7 September - A tropical storm passed about 50 miles south of Guam on a westerly track.

21 September - The center of a typhoon passed just south of Rota, causing considerable destruction on that island and on Guam, with lesser destruction on Tinian and Saipan.

13 November - A tropical storm passed about 75 miles southwest of Guam on a northwesterly track.

1947

There is no record of any tropical storm or typhoon crossing the Marianas or forming in or transiting the vicinity.

1948

(Dates not readily available, months and assigned name of typhoon given).

July - Typhoon 'Pearl' passed about 125 miles south of Guam on a westerly track.

September - Typhoon 'Ione' passed just north of Pagan on a northwesterly track.

*Data obtained through correspondence with the Fleet Weather Central, Guam, and Navy Typhoon Tracking Center, Naval Air Station, San Francisco.

October - Typhoon 'Pat' passed just north of Anatahan on a west north-westerly track.

November - Typhoon 'Rita' formed about 100 miles southwest of Guam and moved northwest.

November - Typhoon 'Agnes' passed just north of Rota, causing some destruction to that island.

December - Typhoon 'Beverly' passed about 125 miles southwest of Guam on a northwesterly track.

1949

24 July - Typhoon 'Hester' formed within 75 miles of Saipan, and moved away to the northwest, diminishing to tropical storm strength within eight hours of the time it passed closest to Saipan.

8 September - Typhoon 'Nelly' formed between Pagan and Alamagan and moved off to the west.

20 October - Typhoon 'Patricia' passed about 150 miles south of Guam on west northwesterly track.

17 November - Typhoon 'Allyn' passed about 45 miles south of Guam on a west northwesterly track causing extensive property damage to military and civilian installations on Guam.

APPENDIX B

Common Plant Associations on Saipan, Tinian, and Rota^a

Strand

Barringtonia asiatica, 'puting,' futu. A handsome tree with dark, glossy leaves and a four-sided pyramidal fruit which, when fresh, is used to stupefy fish, and, when dry, as floats for nets.

Barringtonia racemosa, 'langasat.' A tree, common near the sea and along streams.

Boerhaavia diffusa, 'dafau,' glueweed. A troublesome weed whose root is said to have medicinal qualities.

Calophyllum inophyllum, 'dack,' Palo Maria. A tree growing near the shore; highly valued for its wood and credited with certain medicinal qualities.

Canavali obtusifolium, 'akankan-tasi,' seaside bean. A creeper, useful as a sand-binder.

Casuarina equisetifolia, 'gago,' Polynesian ironwood or Australian pine. A leafless tree with drooping branches, resembling a pine. It loves sandy soil, will grow in brackish places and on otherwise treeless sabanas but almost never in the forest. The wood is heavy, strong, and very hard. It is an excellent fuel and can be used for lumber.

Clerodendron inerme, 'lodugao,' seaside clerodendun. A branching, rambling evergreen shrub. The roots, branches and leaves are boiled to make a bitter medicine for use in the treatment of fevers.

Crinum asiaticum, 'piga-palayi,' antidote lily. A lily-like plant with large white flowers, growing in sandy places near the sea. The bulb is used in various antidote remedies.

Desmodium umbellatum, 'palaga hilitai,' bush ticktrefoil. A strand shrub.

Erythrina variegata, 'gaognao,' East Indian coral tree. A moderate-sized, quick-growing tree in forests near the sea. The wood is soft and light and is used for lumber.

Guettarda speciosa, 'panau,' zebrawood. A small evergreen tree growing near the sea.

Hernandia ovigera, 'nonak,' Jack-in-the-box. A strand tree bearing a small hard fruit enclosed in a very thin inflated oval, resembling a boiled onion. The bark, seed, and young leaves are reputed to be slightly purgative, and the juice of the leaves a depilatory, removing hair without pain. The wood is light and soft and takes fire readily. It is reported that the Japanese developed a method of making a lubricating oil from the seed of this tree during the war emergency.

^aPlant names are arranged in the following order: Botanical name; native name; common English name if known. The author is indebted to Mr. Ignacio Benevente, Agricultural Agent on Saipan, for much assistance in preparing this list. Since variations occur in the botanical classifications as given by various botanists who have worked in the Marianas area, the above list should be regarded as preliminary.

Ipomoea congesta, 'fofgu,' island morning glory. A stout twining plant climbing among thickets. The root is a powerful cathartic.

Ipomoea mariannensis, 'fofgu,' Marianne morning glory. A trailing plant.

Ipomoea pes-caprae, 'alaihai-tasi,' goat's foot convolvulus. An important sand-binding plant; the large root is starchy and is used medicinally.

Morinda citrifolia, 'lada,' Indian Mulberry. A small tree for preparing red and yellow dyes.

Pandanus dubius, 'pahon,' knob-fruited screwpine. A tree growing to a height of nine to twenty feet, with broad, stiff, coarse leaves which are crowded at the ends of branches. Although both fruit and leaves are usable, they are inferior to those of *Pandanus fragrans* and *Pandanus tectorius*.

Pandanus fragrans, 'kafu,' fragrant-fruited screwpine. A small tree nine to 20 feet high. The leaves of this variety have no textile value but the fruit is a favorite of fruit bats and rats and is occasionally eaten by the people.

Pandanus tectorius, 'aggag,' textile screwpine. A small tree with branches beginning very low. The leaves are long, sword-shaped, armed with spines on edges and mid-rib, and have great textile strength. The leaves are woven into mats, bags, et cetera, and are occasionally used for cordage.

Pemphis acidula, 'nigas,' A shrub or small tree, used for firewood.

Pipturus argenteus, 'amahaydan,' silvery pipturus. A shrub or small tree, related to the plant from which the Hawaiians made their tapa.

Pisonia umbellifera, 'langsai,' A tree.

Pithecolobium dulce, 'kamachile,' guamachil. A medium-sized tree bearing heads of small yellow-green flowers followed by pods containing seeds embedded in a sweet white edible pulp which is enjoyed as a tid-bit. The bark of the tree contains 25 per cent tannin. The wood is used for fuel.

Scaevola frutescens, 'nanaso,' fanflower. A shrub common near the seashore but reappearing on the treeless sabanas. Used in concocting an eye medicine.

Sida acuta, 'escobilla,' broomweed. A semi-shrubby perennial, common in waste places. The stems are used for making brooms.

Sida rhombifolia, 'escobilla,' broomweed. A shrubby weed growing by roadsides and in open places. The stems are used for making brooms; they have a slightly different texture than *Sida acuta*.

Terminalia catappa, 'talisai,' Indian almond. A handsome deciduous tree bearing an edible almond-like fruit. The bark and leaves contain tannin. The wood is hard and of a reddish color and is used for carts, posts, and boards.

Thespesia populnea, 'banalu,' milo. This tree is also called Polynesian rosewood. The heartwood is hard, smooth, durable, and of a dark red color.

Tournefortia argentea, 'hunig,' velvetleaf. A small tree, nine to twelve feet tall.

Seaside Cliff and Upper Strand

Bikkia mariannensis, 'gausali,' torchwood. A brushy shrub growing on rocks along the seashore. The wood ignites easily and is used for torches.

Callicarpa cana, 'hamlag.' In thickets and open grass-lands; used for fish poison.

Capparis cordifolia, 'alcaparro,' Marianne caper. A shrub with large white fragrant flowers, and large edible seed capsules. The natives make good pickles from the unripe capsules. It appears from the archives that some of the early governors of Guam exported the fruit in considerable quantities, employing natives to gather it.

Clerodendron inerme (see Strand)

Colubrina asiatica, 'gasoso.' A scandent shrub. The leaves form a soap-like lather in water. The plant is also reputed to have medicinal qualities.

Euphorbia hirta, 'golondrina,' asthma herb. An annual hispid weed, with minute flowers and small round fruit. It is used as a remedy for asthma and bronchitis.

Melanoplepis multiglandulosa, 'alom.' A tree: used medicinally and for shoe lasts.

Pemphis acidula (see Strand)

Scaevola frutescens (see Strand)

Tournefortia argentea (see Strand)

Modified Forest

Adenanthera pavonina, 'Kulalis,' coral bean tree. A handsome deciduous tree which bears pods of glossy scarlet seeds. The heartwood of the large trees is deep red, hard, and durable.

Albizzia lebeck, 'kalaskas.' A slow-growing leguminous tree, reported to have been introduced by the Germans and valued for its lumber.

Annona muricata, 'laguana,' soursop. A small tree bearing large oblong or conical dark green fruit which have a rough spiny skin and are filled with white juicy acid pulp. Natives make jelly and preserve the fruit.

Annona reticulata, 'anonas,' bullock's heart or custard apple. A tree bearing a smooth, heart-shaped fruit with small depressions on the surface; it often turns deep red when ripe. The fruit is not highly regarded by the natives but is favorite of the fruit bat.

Annona squamosa, 'atis,' sweetsop or sugar apple. A small tree yielding a fruit similar in shape and indentation to a pine cone. It is a favorite fruit and is found planted near houses. It is eaten uncooked.

Ardisia sp., 'utud.' A low shrub with small red berries which are eaten by birds.

Artocarpus communis, 'lemae' (seedless), 'dogdog' (fertile), breadfruit. A large tree, common around houses as well as in the forest. Both types bear fruit but that of the 'lemae' is the one most commonly used for food. 'Dogdog' is tapped for latex and cut for lumber. The yellow wood, though not hard, resists the attacks of white ants and is durable when used indoors.

Barringtonia asiatica (see Strand)

Boehmeria tenacissima, 'amahadyan,' rhea. A small indigenous shrub or tree. Related to ramie, it has textile possibilities but is not used so. The bark is said to have medicinal properties.

Canarium odoratum, 'alangilang,' ilangilang. A tree bearing a profusion of greenish-yellow fragrant flowers from which the perfume ilangilang is made. The wood is soft and white and not very durable.

Carica papaya, 'papaya,' papaya. A small tree with a slender fleshy trunk and a crown of large, palmately-lobed leaves. It produces the

melon-like fruit for which it is best known, but is also the source of papain, the dried latex, which has medicinal properties similar to pepsin, as well as meat-tenderizing qualities.

Cassytha filiformis, 'mayagas,' wire vine or dodder laurel. A leafless, wirey, twining parasitic plant very common in thickets.

Claoxylon marianum, 'panao.' A fairly large forest tree.

Cynometra ramiflora, 'gulos.' A common tree in forests. The wood is used for lumber and fuel. It is said to make good charcoal.

Elaeocarpus joga, 'joga.' A large tree with buttressed trunk, bearing a grape-like fruit relished by birds. The wood is not very durable.

Erythrina variegata (see Strand).

Eugenia palumbis, 'agatelang.' A small shrub or tree. The wood is strong and is sometimes used to form the poles along the sides of ox-carts.

Excavatia mariannensis, 'langite,' Marianne yellow-wood. The wood of this medium-sized tree is fine-grained, does not decay readily and resists insects but is not strong. Its yellow wood takes a fine polish and has the advantage of lightness; it is used for furniture and in houses.

Ficus tinctoria, 'hoda.' A tree with prop-like aerial roots. It has small red fruit which resemble crabapples and are relished by certain birds. The wood is used for fuel.

Flagellaria indica, 'bejuco halom-tano.' A vine in forest areas.

Guamia mariannae, 'paipai.' A common tree, fairly large, yielding timbers of twelve to twenty feet, is used in the framework of houses and for handles of fosinos (long-handled thrust hoes). It is said to be subject to attack by termites.

Hernandia ovigera (see Strand).

Intsia bijuga, 'ifil.' The most important of the area's timber trees but already becoming extremely scarce. The heartwood is very hard, cross-grained and difficult to work. At first the wood is yellowish then turns a rust color and assumes a dark color resembling black walnut with time. It is very durable and resists attack by termites. When old the wood is so hard that holes must be bored before nails are driven.

Laportea saipanensis, 'kahtat.' A fairly large endemic tree.

Melanoplepis multiglandulosa, (see Seaside cliffs)

Mucuna gigantea, 'akankan dangkulo,' great ox-eye bean. A woody climber which grows on the edge of forests, sometimes climbing over high trees.

Ochrocarpus excelsus, 'chopag.' A medium-sized tree, the wood of which is hard, heavy, fine-grained, and durable as poles in the ground. It is used for posts and beams in house construction and the red heartwood yields a dye.

Ochrosia parviflora, 'faag.'

Pandanus dubius (see Strand).

Pandanus fragrans (see Strand).

Pandanus tectorius (see Strand).

Pipturus argenteus (see Strand).

Pisonia grandis, 'umumu.' A very large tree but the wood is too soft for lumber.

Premna gaudaudii, 'ahgao,' false elder. A shrub or small tree, the wood of which is hard and durable though knotty and often crooked. It is used for boards in house construction. It is also of medicinal value; the bark, steeped in water, is used for neuralgia.

Psychotria mariana, 'aploghating.' A glabrous shrub or small tree. The wood is durable and is used in house construction, as well as for fire-wood.

Tarennia glabra, 'sumag.' A medium-sized tree whose wood is reported to be flexible, free from attack by white ants and usable for lumber. The leaves are credited with medicinal properties.

Terminalia catappa (see Strand).

Planted Forest

Acacia confusa, Formosan koa. Planted extensively by the Japanese for firewood for use on the railroad, in sugar factories, and in the making of charcoal.

Casuarina equisetifolia, (see Strand) planted mainly as a sand binder along the beaches and on sandy slopes but also for firewood.

Pithecolobium dulce (see Strand), planted principally for use as firewood.

Marsh

Acrostichum aureum, 'langayao,' marsh fern. A large fern with smooth leathery fronds.

Cyperus sp., 'sasa'.

Phragmites karka, 'karriso,' marsh reed. A tall perennial grass. The smooth, stout, hollow stems are split and woven into matting to cover inside and outside walls. It is sometimes used as lath.

Former cultivated areas

Abrus precatorius, 'kolales halom-tano,' coral-bead vine. A twining vine very common in thickets. The latter part of its botanical name, *precatorius*, was acquired because the seeds are often strung as rosary beads. The seeds are known as 'jequirity beans' in pharmacy and contain two proteid poisons similar in physiological and toxic properties to snake venom.

Ipomea congesta (see Strand).

Ipomoea mariannensis (see Strand).

Leucaena glauca, 'tangan-tangan,' hedge acacia. A shrub or small tree which invades disturbed areas very rapidly and forms dense thickets. In abandoned camp areas, barracks have frequently become entirely obscured by it. It is, however, of considerable value as a nitrogen-producing legume in helping to revitalize the soils which it occupies.

Passiflora foetida. A common creeping vine.

APPENDIX C

Notes on Figures¹

Fig. No

1. Position of the Marianas in the Pacific.
Base and Data: Adapted from a world map published by the Tropical Geographical Society.
2. The Mariana Islands.
Base and Data: Adapted from U. S. Navy Hydrographic Office Chart No. 5360.
3. Profile Sections of the Mariana Arc.
Source: Adapted from profiles, William H. Hobbs, *Fortress Islands of the Pacific* (Ann Arbor: J. W. Edwards, 1945), p. 14.
4. The Surface Geology of Saipan.
Base: Second Marine Division, Mapping and Reproduction Section, Map of Saipan, editions of October, 1944 (1:20,000), and December, 1944 (1:50,000).
Data: Adapted from a geologic map of Saipan by Risaburo Tayama, 'Topography, Geology, and Coral Reefs of Saipan,' (Translations of a report found on Saipan during the invasion, available infiles, Civil Administration Unit, Saipan).
5. Mariana Arcs.
Base: Same as for Figure 2.
Data: John Bartholomew, *The Advanced Atlas of Modern Geography* (New Series, first edition; London: Meiklejohn and Sons, 1950); U. S. Hydrographic Office, *Sailing Directions for the Pacific Islands*, Vol. I (Washington: Government Printing Office, 1938); U. S. Hydrographic Office, *Supplement to Sailing Directions for the Pacific Islands*, Vol. I (Washington: Government Printing Office, 1949); U. S. Hydrographic Chart No. 5950.
6. Schematic Block Diagram of an Island Arc of the Marianas Type.
Source: Adapted from J. H. F. Umbgrove, *The Pulse of the Earth* (The Hague: Martinus Nijhoff, 1947), p. 174.
7. Surface Regions of Saipan, Tinian, and Rota.
Base: Saipan: same as for Figure 4. Tinian: Sixth Naval Construction Brigade, Second provisional base map. 1945. Rota: Army Map Service, Map No. W841, Rota, Mariana Islands, (1:25,000) 1945.
Data: Field mapping.

¹Photographs not listed among the figures were taken by the author while in the Northern Marianas in 1947 and 1948.

Fig. No.

8. Terrain, Saipan.
Base and Data: From maps as for Figure 4; field mapping.
9. Emerged Marine Terraces of Taipingot, Rota.
Source: U. S. Navy photograph, 1944.
10. Climatic Graph, Garapan, Saipan.
Data: U. S. Weather Bureau, Washington, D. C. Temperature data are averaged over a six-year period, precipitation data over nineteen years.
11. February Winds over the Marianas.
Base and Data: Adapted from Gerhart Schott, *Geographie des Indischen und Stillen Ozeans* (Hamburg: C. Boysen, 1935), Tafel XIII.
12. August Winds over the Marianas.
Base and Data: Adapted from Tafel XIV, source as for Figure 11.
15. Ancient Chamorro Village.
Source: L. C. Freycinet, *Voyage autour du Monde*, folio atlas, (Paris: Chez Pillett Aine, Imprimeur-Libraire, 1829-1839).
16. Garapan after American Capture.
Source: U. S. Air Force Photograph, 1944.
17. Pigafetta's Map of the Ladrões or Marianas.
Source: James Robertson, *Magellan's Voyage Around the World by Antonio Pigafetta*, Vol. I (Cleveland: Arthur H. Clark Co., 1906), p. 88.
18. Map of the Ladrões (Marianas) after Sebastian Cabot.
Source: 'Karte des Sebastian Cabot vom Jahre 1544,' *Die Entdeckung Amerika's in Ihrer Bedeutung für von Konrad Kretschmer* (Berlin: W. K. Kuhl, 1892), Atlas, Tafel XVI.
21. Tinian, 1944.
Base: Joint Intelligence Center Pacific Ocean Areas (JICPOA), Air target maps and photographs, *Tinian and Rota*, May, 1944.
Data: Base maps and photographs as given above; aerial photographs, U. S. Navy sortie VDS-P44D, ONI-OP16-P5; field mapping.
22. Air View of Tinian Island.
Source: U. S. Navy photograph, 1944.
23. Japanese Rural Settlement Pattern.
Source: U. S. Navy photograph, Sortie XD3-P44D, ONI-OP16-P5, April, 1944.
24. Distribution of Native Farms, Rota.
Base: Same as for Figure 42.
Data: Field mapping.

Fig. No.

- 25, 26. Scenes in the First Civilian Internment Camps.
Source: Military Government photograph, 1944.
27. Saipan: Civilian Internment Camp.
Source: Military Government photograph, 1944.
29. Saipan: 'Noontime' House and Small Farm Plot.
Source: Military Government photograph, 1944.
30. Saipan: American Military Installations.
Source: Air Force photograph, 1945.
34. The Trust Territory of the Pacific Islands.
Base and Data: Adapted from Civil Administration Map of the Trust Territory, U. S. Navy, *Handbook on the Trust Territory of the Pacific Islands* (Washington: Government Printing Office, 1948), frontispiece.
35. Prewar and Postwar Population in the Marianas.
Base: Same as for Figure 2.
Data: U. S. Navy Department, Office of the Chief of Naval Operations, *The Mandated Marianas Islands* (Washington: 1944), pp. 34-35.
36. Population Distribution, Saipan, 1937.
Base: Same as for Figure 4.
Data: Base maps; aerial photography, Engineer's Office, Saipan; field mapping.
37. Population Distribution, Saipan, 1949.
Base: Same as for Figure 4.
Data: Field mapping.
38. Native Property Holdings, Tanapag Village, Saipan.
Base and Data. Prepared by Joaquin Caipat, Civil Administration Office, Saipan.
40. Temperature and Precipitation Extremes, Garapan, Saipan.
Data: Same as for Figure 10.
41. Land Utilization, Saipan, about 1930.
Base: Same as for Figure 4.
Data: Interviews with native residents of Saipan; Fleet Marine Force Staff Map of Saipan (1:20,000), 1934.
42. Rota Island, Land Leased by Sugar Company.
Base: Army Map Service, Map No. W841, Rota, Mariana Islands (1:25,000), 1945.
Data: Japanese Map in the possession of Thomas C. Mendiola, Songsong, Rota; field mapping.

Fig. No.

43. Travel Time by Oxcart from Chalan Kanoa, Saipan.
Base: Same as for Figure 4.
Data: Measurements taken in the field; interviews with the native residents of Saipan.
44. Distribution of Native Farms, Saipan.
Base: Same as for Figure 4.
Data: Field mapping.
45. Distribution of Native Farms, Tinian.
Base: War Department, Office of the District Engineer, Guam, Map of Tinian Island (1:20,000).
Data: Field mapping.
47. Uleai Village, Saipan.
Base and Data: Field mapping.
48. Site of Songsong Village.
Source: U. S. Navy photograph, 1944.
- 49, 50, 52. Songsong Village, Rota.
Base: Field mapping.
Data: Interviews with the native residents of Rota; field mapping.
51. Songsong Village at End of War.
Source: U. S. Navy photograph, 1945.
58. Chamorro Farm.
Base and Data: Field mapping.
70. Soils of Tinian.
Base: Same as for Figure 45.
Data: Adapted from Oliver C. Rogers, *Report on the Soils of Micronesia*, Vol. XII, *Economic Survey of Micronesia* (Honolulu: U. S. Commercial Company, 1946), Figure 7; field mapping.
75. Location of Soil Samples.
Base: Same as for Figure 7.
Data: Field mapping and collection of soil samples.
83. Pitted Surface after Phosphate Mining.
Source: U. S. Commercial Company photograph by William D. Mark, 1946.
84. Former Japanese Mining Operations, Saipan.
Base: Same as for Figure 4.
Data: Field mapping; Josiah Bridge, *Mineral Resources of Micronesia*, Part I, Vol. III, *Economic Survey of Micronesia* (Honolulu: U. S. Commercial Company, 1946) Figure 6.
86. The Landing Place at Tinian as Seen by Anson.
Source: *History of Commodore Anson's Voyage Round the World* (London: M. Cooper, 1767), p. 141.

BIBLIOGRAPHY

- Agassiz, Alexander. 'Explorations of the Albatross in the Pacific Ocean,' *American Journal of Science*, Series 4, Vol. IX (1900), pp. 372-374.
- . 'Coral Reefs of the Tropical Pacific,' *Memoirs of the Museum of Comparative Zoology at Harvard*, Vol. XXXVIII, 1903.
- 'Agricultural Notes from Guam,' *Guam Recorder*, Vol. I (1924), August, pp. 9-10, Vol. II (1925), March, p. 10.
- Alaux, Jean-Paul. *Magellan Le Premier Voyage atour du Monde*, Paris: Georges Servant, 1925.
- Alexander, James M. *The Islands of the Pacific*. New York: American Tract Company, 1895.
- Alexander, Wilfrid Backhouse. *Birds of the Ocean*. New York: G. P. Putnam's Sons, 1928.
- Allen, E. W. 'The North Pacific Fisheries,' *Pacific Affairs*, Vol. X, 1937, pp. 136-151.
- 'Allgemeine Auskunft uber das Inselgebiet der Karolinen, Palau, und Marianen,' *Deutsch Kolonialblatt*, Vol. XIV, 1903, pp. 683-684.
- Alpert, E. 'Nutrition and Dietary Patterns in Micronesia,' *Economic Survey of Micronesia*, Vol. XVIII, 1946. Honolulu: U. S. Commercial Company. (Typescript, Library of Congress microfilm.)
- Anderson, Clinton. Secretary of Agriculture to John L. Sullivan, Secretary of the Navy, Letter on Proposed United States Agricultural Program for the Trust Territory of the Pacific Islands, December 1, 1947.
- Andrews, C. L. 'Conservation of Health in Guam,' *Guam Recorder*, Vol. XI (October, 1934), pp. 152-154.
- Andrews, E. C. 'Origin of the Pacific Insular Floras,' *Proceedings Sixth Pacific Science Congress*, Vol. IV, 1939. Berkeley: University of California Press, 1940, pp. 613-620.
- Anson, George. *History of Commodore Anson's Voyage Round the World, performed, 1740-1744*. By a midshipman on board the Centurian. London: M. Cooper, 1767.
- . *A Voyage Around the World in the Years MDCCXL, I, II, III, IV*. Compiled from papers and other materials by Richard Walter, Everyman's Library. London: J. M. Dent and Sons, 1911.

- Arago, Jacques. *Narrative of a Voyage Around the World in the 'Uranie' and 'Physicienne' Corvettes during the Years 1817, 1818, 1819, and 1820 Commanded by Captain Freycinet*. London: Treuttel and Wurtz, Gun and Richter, 1823.
- _____. *Promenade autour du monde, pendant les annees 1817, 1818, 1819 et 1820 sur les corvettes du roi l'Uranie et la Physicienne, commandees par M. Freycinet*. Vol. I, II, and folio atlas Paris Leblanc, Imprimeur-Libraire, 1822.
- Arber, Edward (ed.). 'A Briefe Declaration of the Vyage or Navigation abowte the Worlde.' Translations and compilations by Richard Eden. *The First Three English Books on America*. 1511-1555. Westminster: Archibald Constable and Company, 1895, pp. 249-262.
- Arrayoz, Pastor. 'The Population of the Marianas in Early Times,' *Guam Recorder*, Vol. XV (February, 1939), pp. 24; 41-42.
- Artelui y Leon, Lieut. Col. Jose and others. 'Indice general de las reales cedulas de las comunicadas por el Real Audiencia y Superior Gobierno de Filipinas, y sus ordenes, y demas papeles creados en tiempo de los Gobernadores de estas Yslas Marianas existente en el Archivo. Agana, July 8, 1787 - Sept. 30, 1843.' Manuscript, Library of Congress, Division MSS, AC508, Box 2.
- 'At Camp Susupe,' *Time*, Vol. LXIV (October 30, 1944), pp. 74-76.
- Bailey, K. H. 'Dependent Areas of the Pacific,' *Foreign Affairs*, Vol. XXIV (1946), pp. 494-512.
- Baker, Rollin H. 'Size of Bird Populations at Guam, Mariana Is.,' *Condor*, Vol. XLIX (1947), pp. 124-125.
- Beaglehole, J. C. *The Exploration of the Pacific*. The Pioneer Histories Series. London: A. and C. Black, Ltd.
- Beaufort, John. 'How the Navy 'Governs' Saipan,' *Christian Science Monitor*, January 13, 1945.
- Bedell, J. 'In Trust We Annex,' *New Republic*, Vol. CXVI (1947), p. 31.
- Beechey, F. W. *Narrative of a Voyage to the Pacific and Beering's Strait... in... Ship Blossom, under the Command of Captain F. W. Beechey... in ...1825-28*. Vol. II. London: Henry Colburn and Richard Bentley, 1831.
- Bembower, William. *Banana Culture*. Hawaii Agricultural Experiment Station, Agricultural Extension Circular No. 238. Honolulu: University of Hawaii, 1948.
- Betz, F. and Hess, H. H. 'Floor of the North Pacific Ocean,' *Geographical Review*, Vol. XXXII (1942), pp. 96-116.

- Bienstock, Gregory. *The Struggle for the Pacific*. New York: Macmillan Co., 1937.
- Blair, Emma Helen and Robertson, James Alexander. *The Philippine Islands, 1493-1898*, Vols. I, II, III. Cleveland: Arthur H. Clark Co., 1903.
- Blakeslee, George Hubbard. *The Pacific Area*. Boston: World Peace Foundation, 1929.
- Block, Magnus. *Der Mensch auf den hohen Inseln Mikronesiens und Polynesiens*. Hamburg: Hambergischen Universitat, 1935.
- Blumenstritt, F. 'Die Mariannen Inseln,' *Globus*, Vol. XLIV, (1883), pp. 136-139.
- Boggs, S. Whittemore. 'American Contributions to Geographical Knowledge of the Central Pacific,' *Geographical Review*, Vol. XXVIII (1938), pp. 177-192.
- Borden, C. A. 'Far-flung Islands of Micronesia,' *Travel*, Vol. LXXXV (1945), pp. 4-9.
- Bowker, H. F. 'Game Birds for Guam,' *Guam Recorder*, Vol. XIV (August, 1937), pp. 21, 38.
- _____. 'Aggag,' *Guam Recorder*, Vol. XV (April, 1938), pp. 28-29, 47.
- Bowman, Robert G. 'Army Farms and Agricultural Development in the Southwest Pacific,' *Geographical Review*, Vol. XXXVI (1946), pp. 420-446.
- Bridge, Josiah. 'Mineral Resources of Micronesia,' *Economic Survey of Micronesia*, Vol. III, Part 1, 1946. Honolulu: U. S. Commercial Company. (Typescript, Library of Congress microfilm.)
- _____. 'A Restudy of the Reported Occurrence of Schist on Truk, Eastern Carolinian Islands,' *Pacific Science*, Vol. II, No. 3 (1948), pp. 216-222.
- 'Brief Notes on Some Ruins or Monuments of the Marianas Islands,' *Guam Recorder*, Vol. IX (January, 1933), pp. 172-173.
- Briggs, Glen. *Para and Paspalum: Two Introduced Grasses of Guam*. Guam Agricultural Experiment Station Bulletin No. 1. Washington: Government Printing Office, 1921.
- _____. 'A Study of Crop Production on New and Old Soils of Guam.' Unpublished Master's thesis, Department of Agronomy, Oklahoma Agricultural and Mechanical College, 1922.
- _____. *Vegetable Growing in Guam*. Guam Agricultural Experiment Station Bulletin No. 2. Washington: Government Printing Office, 1922.

- Briggs, Glen. *The Sorghums in Guam*. Guam Agricultural Experiment Station Bulletin No. 3. Washington: Government Printing Office, 1922.
- _____. *Leguminous Crops for Guam*. Guam Agricultural Experiment Station Bulletin No. 4. Washington: Government Printing Office, 1922.
- _____. *Effect of Time of Planting and Fertilizers on the Yield of Vegetables*. Guam Agricultural Experiment Station Bulletin No. 5. Washington: Government Printing Office, 1926.
- British Admiralty. *Pacific Islands Pilot*. Vol. I, 7th ed. London: Great Britain Hydrographic Department, 1946.
- Brookes, Jean Ingram. *International Rivalry in the Pacific Islands, 1800-1875*. Berkeley: University of California Press, 1941.
- Brown, Frank. *Bananas*. Agricultural Circular 1. Saipan: Agricultural Experiment Station, 1948. (Mimeographed.)
- Brown, J. Macmillan. *Peoples and Problems of the Pacific*, Vols. I and II. London: T. Fisher Unwin, 1927.
- Bryan, Edwin H. 'Check List of the Plants of the Island of Guam,' Pacific Science Board, Honolulu, 1935. (Typewritten manuscript.)
- _____. 'The Plants of Guam,' *Guam Recorder*, Vol. XIII (November, 1936), pp. 22-23, 36-37.
- _____. 'Notes on the Ancient Culture of Guam,' *Guam Recorder*, Vol. XIV (1937), June, pp. 6-9; July, pp. 12-13; August, pp. 12-13; September, pp. 11-13.
- _____. 'Notes on the Bats of Guam,' *Guam Recorder*, Vol. XVI (April, 1939), p. 23.
- _____. 'Geographic Summary and Notes on Climate,' *Economic Survey of Micronesia*, Vol. II, Part 1. Honolulu: U. S. Commercial Company, 1946. (Typescript, Library of Congress microfilm.)
- _____. 'Gazeteer of Micronesia,' *Economic Survey of Micronesia*, Vol. II, Part 2. Honolulu: U. S. Commercial Company, 1946. (Typescript, Library of Congress microfilm.)
- _____. 'Atlas of Micronesia,' *Economic Survey of Micronesia*, Vol. II, Part 3. Honolulu: U. S. Commercial Company, 1946. (Typescript, Library of Congress microfilm.)
- _____. *Bibliography of Micronesian Entomology*. Honolulu: Pacific Science Board, 1948. (Mimeographed.)
- _____. 'Insect Control in Micronesia,' *Far Eastern Survey*, Vol. 17 (1948), pp. 193-194.

- Bryan, Edwin H. *Economic Insects of Micronesia*. Washington: National Research Council, 1949.
- Burney, James. *A Chronological History of the Discoveries in the South Seas or Pacific Ocean, Part I*. London: L. Hansard, 1803.
- Campbell, Ernest C. 'Japan's Mandate in the Southwest Pacific,' *United States Naval Institute Proceedings*, Vol. LXVIII, (1942), pp. 829-834.
- Carter, T. D., Hill, J. E., Tate, G. H. H. *Animals of the Pacific World*. Washington: Infantry Journal Press, 1944.
- Castro, Juan de and others. 'Testimonio de la diligencias instruidas en averiguacion de la desaparicion del arrendador M. G. H. Johnston y companeros en su ida de la isla Tinian a Saipan y el paradero de dichos individuos Oct. 22, 1876 - May 2, 1877, Saipan.' Library of Congress Manuscript, Division MSS, Ac 508, Box 16.
- 'Cattle Project at Cotot Farm,' *Guam Recorder*, Vol. XVI (October, 1939), p. 291.
- Chamber of Commerce, Honolulu. 'Report on Pacific Islands.' Honolulu: Chamber of Commerce, 1945. (Mimeographed.)
- Chamisso, Adelbert von. *Reise um die Welt mit der Romanzossischen Entdeckungs-Expedition in den Jahren 1815-1818 auf der Brigg Rurik, Kapitain Otto v. Kotzebue*. Berlin: Weidmannsche Buchhandlung, 1864.
- 'Chamorro Natives Leave Yap Homeland,' *Guam News*, Vol. IV (April 11, 1948).
- Champman, Wilbert McLeod. 'Tuna in the Mandated Islands,' *Far Eastern Survey*, Vol. XV (1946), pp. 317-319.
- 'Characteristics of the Natives of Guam when First Settled by Spanish,' *Guam Recorder*, Vol. VI (January, 1930), p. 188.
- Chubb, L. J. 'The Structure of the Pacific Basin,' *Geological Magazine*, Vol. LXXI (1934), pp. 289-302.
- Churchill, William. 'Germany's Lost Pacific Empire,' *Geographical Review*, Vol. X (1920), pp. 34-90.
- Clark, Lt. Cdr. T. O. 'The Administration of the Former Japanese Mandated Islands,' *U. S. Naval Institute Proceedings*, Vol. LXXII (1946), pp. 510-515.
- Clarkson, R., and Kling, S. 'Should We Retain Our Pacific Bases?' *Forum*, Vol. CVIII(1947), pp. 48-57.
- Clyde, Paul Hibbert. *Japan's Pacific Mandate*. New York: Macmillan Co., 1935.
- 'Coconut as Food,' *Guam Recorder*, Vol. I (November, 1924), pp. 7-8.

- Collier, John. 'America's New Stepchildren,' *Common Sense Magazine*, Vol. XIV (July, 1945), pp. 9-12.
- Colquhoun, Archibald Ross. *The Mastery of the Pacific*. London: W. Heinemann, 1902.
- Condliffe, John Bell. *The Pacific Area in International Relations*. Chicago: American Library Association, 1931.
- Conover, Helen F. *Islands of the Pacific, A Selected List of References*. Washington: Library of Congress, General Reference and Bibliography Division, 1943.
- _____. *Islands of the Pacific: Supplement*. Washington: Library of Congress, General Reference and Bibliography Division, 1945.
- _____. *Non-Self-Governing Areas*, Vols. I and II. Washington: Library of Congress, General Reference and Bibliography Division, 1947.
- Coolidge, Harbld J. *Conservation in Micronesia*. Washington: National Research Council, 1948.
- Coon, Carlton S., and Andrews, James M. 'Studies in the Anthropology of Oceania and Asia,' *Papers of the Peabody Museum of American Archaeology and Ethnology, Harvard University*, Vol. XX, 1943.
- Corte, Felipe Maria de la (Gov. of the Marianas). 'Decrees, Orders, etc., Regarding the Government of the Marianas, Jan. 4, 1861 - Jan. 21, 1865, Agana.' Library of Congress Manuscript Division, MSS, Ac 508, Box 21.
- _____. 'Historia de las Islas Marianas hasta Mayo de 1870.' Library of Congress Manuscript Division, MSS, Ac 1760.
- _____. *Memoria Descriptiva e Historica de las Islas Marianas*. Madrid: Imprenta Nacional, 1876.
- _____. *Memoria Descriptiva e Historica de las Islas Marianas*. Madrid: Imprenta Nacional, 1876. Translation by Mrs. H. G. Hornbostel, Bishop Museum Library. (Typewritten.)
- Costenoble, H. 'Die Marianen, *Globus*, Vol. LXXXVIII (1905), pp. 4-9, 72-81, 92-94.
- Coulter, John Wesley. *Agricultural Land Use Planning in the Territory of Hawaii*. Hawaii Agricultural Experiment Station Extension Bulletin No. 36. Honolulu: University of Hawaii, 1940.
- _____. 'Impact of the War on the South Sea Islands,' *Geographical Review*, Vol. XXXVI (1946), pp. 409-419.
- _____. 'Environment, Race and Government in South Sea Islands,' *Scottish Geographical Magazine*, Vol. LXIII (1947), pp. 49-56.

- Coulter, John Wesley. 'The United States Trust Territory of the Pacific Islands,' *The Journal of Geography*, Vol. XLVII (1948), pp. 253-267.
- Cowan, Richard Sumner. 'Tinian Plants Collected by R. S. Cowan,' *Bulletin of the Torrey Botanical Club*, Vol. LXXIII (1946), p. 588.
- Cox, L. M. 'The Island of Guam,' *Bulletin of the American Geographical Society*, Vol. XXXVI (1904), pp. 385-395.
- _____. *The Island of Guam*. Washington: Government Printing Office, 1917.
- Crampton, Henry E. 'A Journey to the Mariana Islands--Guam and Saipan,' *Natural History*, Vol. XXI (1921), pp. 126-145.
- 'Crozet's Voyage to Tasmania, New Zealand, the Ladrone Islands, and the Philippines in the Years 1771-1772.' Trans. by H. Ling Roth. London: Ruslove and Shirley, 1891.
- Curran, C. H. *Insects of the Pacific World*. Washington: Infantry Journal Press, 1946.
- Daly, Reginald Aldworth. *The Floor of the Ocean*. Chapel Hill: University of North Carolina Press, 1942.
- Dampier, Captain William. *A New Voyage Around the World*, Vol. I, 5th ed. London: Printed for James Knapton at the Crown in St. Paul's Churchyard, 1703.
- _____. *Dampier's Voyages*. London: E. Grant Richards, 1906.
- Daniel, Hawthorne. *Islands of the Pacific*. New York: G. P. Putnam's Sons, 1943.
- Davidson, D. S. 'Antiquity of Man in the Pacific,' *Early Man*. International Symposium on Early Man, Philadelphia, 1937. Philadelphia: J. B. Lippincott, 1937.
- Davis, W. M. *The Coral Reef Problem*. New York: American Geographical Society, 1928.
- Dean, V. M. 'Nations at Work: Trusteeship Military Model,' *Nation*, Vol. CLXIII (1946), pp. 547-548.
- Decker, John Alvin. *Labor Problems in the Pacific Mandates*, Institute of Pacific Relations. Shanghai: Kelly and Walsh, Ltd., 1940.
- Dennett, Raymond. 'U. S. Navy and Dependent Areas,' *Far Eastern Survey*, Vol. XIV (1945), pp. 93-95.
- 'Department of Agriculture Notes,' *Guam Recorder*, Vol. XIV (1937), May, p. 26; July, p. 29; August, p. 21; September, p. 24; November, p. 27; December, p. 24.

- Director of Experiments, Rota Sugar Works Agricultural Department, 'Twelfth Report of the Director of the Rota Experiments.' Prepared for the South Seas Development Company, October 3, 1938. Translated by U. S. Commercial Company, Honolulu, 1946. (Typewritten.)
- Dixon, George. *A Voyage Round the World; Performed in 1785, 1786, 1787, 1788, in the 'King George' and 'Queen Charlotte,' Captains Portlock and Dixon.* London: Geo. Goulding, 1789.
- Dixon, Roland B. 'Polynesia and Micronesia,' *The Racial History of Mankind.* New York: Charles Scribner's Sons, 1923, pp. 377-390.
- Donlon, Father Adelbert. 'The Latte, What Are They?' *Guam Recorder*, Vol. XVIII (April, 1941), pp. 7-9, 36-37.
- Eckert, Georg. 'Die Zuckerproduktion auf den Marianen,' *Koloniale Rundschau*, Vol. XXVII (1936), pp. 219-221.
- _____. 'Die Eingeborenerziehung in Japanischen Mandatsgebiet,' *Koloniale Rundschau*, Vol. XXIX (1938), pp. 247-253.
- Embree, J. F. 'Micronesia: The Navy and Democracy,' *Far Eastern Survey*, Vol. XV (1946), pp. 161-164.
- Emerson, Rupert. *America's Pacific Dependencies.* New York: American Institute of Pacific Relations, 1949.
- Emory, Kenneth P. *South Sea Lore.* Special Publication 36, Bernice P. Bishop Museum. Honolulu: Bishop Museum Press, 1944.
- Endlicher, Stephan. 'Flora Der Sudseeinseln,' *Annalen des Wiener Museums der Naturgeschichte*, Vol. I (1836), pp. 131-190.
- Esaki, Teiso. 'A Preliminary Report on the Entomological Survey of the Micronesian Islands under Japanese Mandate, with Special Reference to the Insects of Economic Importance,' *Proceedings of the Sixth Pacific Science Congress*, Berkeley, 1939, Vol. IV, pp. 407-416. Berkeley: University of California Press, 1940.
- Eyre, James K. 'Japanese Expansion Toward the Mandated Islands,' *U. S. Naval Institute Proceedings*, Vol. LXX (1944), pp. 1321-1331.
- Fairbank, Nathaniel K. *Handicraft.* An Investigation of the Present and Potential Market for Non-competitive Handicraft in the United States. Washington: Division of Self-Help Cooperatives, Federal Emergency Relief Administration, 1934. (Mimeographed.)
- Fanning, Edmund. *Voyages Round the World; With Selected Sketches of Voyages to the South Seas, North and South Pacific Oceans...Also Information Relating to Important Late Discoveries Between 1792 and 1832.* New York: Collins and Hannay, 1833.
- 'Farmers of Today,' *Guam Recorder*, Vol. XV (March, 1939), p. 17.

- Feldkamp, Fred. 'Civil Affairs on Saipan,' *Asia*, Vol. XLV (1945), pp. 33-37.
- Field, Frederick V. *Economic Handbook of the Pacific Area*. New York: Doubleday, Doran and Co., 1934.
- Fifield, Russel H. 'Disposal of the Carolines, Marshall, and Marianas at the Paris Peace Conference,' *American Historical Review*, Vol. LI (1946), pp. 472-479.
- Fitzner, Rudolph. 'Die Bevolkerung der Deutschen Sudseekolonien,' *Globus*, Vol. LXXXIV (1903), pp. 21-25.
- Flores, Jose M. 'The Future of Guam Lies in the Soil,' *Guam Recorder*, Vol. XVI (May, 1939), p. 62.
- Ford, Charles. 'Charles Ford Comments on Guam and Magellan,' *Guam Recorder*, Vol. XV (March, 1939), pp. 7-9, 32.
- Fosberg, F. R. 'Botanical Report on Micronesia,' *Economic Survey of Micronesia*, Vol. XV. Honolulu: U. S. Commercial Co., 1946. (Typescript, Library of Congress microfilm.)
- Fowler, Henry W. *Fishes of Guam, Hawaii, Samoa and Tahiti*. Bernice P. Bishop Museum Bulletin No. 22. Honolulu: Bishop Museum Press, 1925.
- Fowler, Henry W. *Fishes of the Tropical Central Pacific*. Bernice P. Bishop Museum Bulletin No. 38. Honolulu: Bishop Museum Press, 1927.
- _____. *The Fishes of Oceania*, Vol. X. Memoirs of the Bernice P. Bishop Museum. Honolulu: Bishop Museum Press, 1928.
- _____. *The Fishes of Oceania*, Vol. XI, Supplement 1. Memoirs of the Bernice P. Bishop Museum. Honolulu: Bishop Museum Press, 1931.
- _____. *The Fishes of Oceania*, Vol. XI, Supplement 2. Memoirs of the Bernice P. Bishop Museum. Honolulu: Bishop Museum Press, 1935.
- _____. 'Fishes from Saipan Island, Micronesia,' *Proceedings of the Academy of Natural Science*, Philadelphia, Vol. XCVII (1945), pp. 59-74.
- Freeman, Otis W. 'The Pacific Island World,' *Journal of Geography*, Vol. XLIV (1945), pp. 16-30.
- Freycinet, Louis d. *Voyage autour du monde entrepris par ordre du roi, execute sur les corvettes de S. M. 'L'Uranie' et la 'Physicienne' pendant les annees, 1817, 1818, 1819, et 1820*, Tome II and folio atlas. Paris: Chez Pillet Aine, Imprimeur-Libraire, 1829-1839.
- Fritz, G. 'Bericht uber du Insel Rota,' *Mittheilungen aus den Deutschen Schutzgebieten*, Vol. XIV (1901), pp. 194-204.

- Fritz, G. 'Reise nach den nordlichen Marianen,' *Mitteilungen von Forschungsreisenden und Gelehrten aus den Deutschen Schutzgebeiten*, Vol. XV (1902), pp. 96-118.
- _____. 'Bestellung der Privategrundstucke im Amtsbezirke der Marianen,' *Deutsches Kolonialblatt*, Vol. XIV (1903), pp. 239-40.
- _____. 'Die Chamorro, Eine Geschichte und Ethnographie der Marianen,' *Ethnologisches Notizblatt des Koniglichen Museums fur Volkerkunde in Berlin*, Band III (1904), pp. 25-110.
- _____. 'Von den Marianen,' *Globus*, Band LXXXIX (1906), pp. 287-289.
- Gallagher, K. J. 'The Problem of the Former German Colonies,' *Current History*, Vol. 25 (1927), pp. 663-668.
- Gallahue, Edward E. 'The Economy of the Marianas,' *Economic Survey of Micronesia*, Vol. V. Honolulu: U. S. Commercial Company, 1946. (Mimeographed). (Typescript, Library of Congress microfilm.)
- Gantt, Paul A. 'Livestock Survey of Micronesia,' *Economic Survey of Micronesia*, Vol. 15, Honolulu: U. S. Commercial Company, 1946. (Typescript, Library of Congress microfilm.)
- Garcia, Luis. *Historia de las Isles Marianas*. Granada: Paulino V. Savatel, 1888.
- Garcia, Padre Francisco. *Vida Y Martoyrio de el Venerable Padre Diego Luis de Sanvitores de la Compania de Jesus*. Madrid, 1683. Translated by Margaret Heggens in *Guam Recorder*, Vol. XIII (September, 1936) to Vol. XV (July, 1939).
- Gayn, Mark J. *The Fight for the Pacific*. New York: Morrow and Company, 1941.
- Gibson, Weldon B. *Skyways of the Pacific*. American Institute of Pacific Relations Pamphlet No. 27. New York: Institute of Pacific Relations, 1947.
- Gilchrist, Huntington. 'The Japanese Islands: Annexation or Trusteeship?' *Foreign Affairs*, Vol. XXII (1944), pp. 635-642.
- _____. 'Trusteeship and the Colonial System,' *Proceedings of the Academy of Political Science*, Vol. XXII (1946), pp. 203-217.
- Gill, Lorin Tarr. 'The Coral Tombstones of the Marianas,' *Art and Archaeology*, Vol. XVIII (1934), pp. 154-166.
- _____. 'Ancient Stone Ruins Surpassing Stonehenge Found on Pacific Island,' *Guam Recorder*, Vol. I (February, 1925), pp. 4, 12.
- Gobien, Charles. *Histoire des isles Marianes, nouvellement converties a la religion Chrestienne; et de la mort glorieuse des premiers missionnaires qui y ont preche la foy*. Paris: Nicolas Pepie, 1700.

- Godsil, H. C., and Byres, Robert D. *A Systematic Study of the Pacific Tunas*, Fish Bulletin No. 60. Sacramento: Department of Natural Resources, Division of Fish and Game, 1944.
- 'Good Old Days in Guam 100 Years Ago,' *Guam Recorder*, Vol. I (February, 1925), p. 33.
- Goodrich, Leland M., and Hambro, Edward. *Charter of the United Nations, Commentary and Documents*. Boston: World Peace Foundation, 1946.
- Gordon, G. D., and Harvey, R. W. 'Battle of the Rocks,' *American Mercury*, Vol. LXI (1945), pp. 620-625.
- Grange, L. I. 'Soils of Some South Pacific Islands,' *Proceedings of the First Commonwealth Conference on Tropical and Sub-Tropical Soils*, 1948, Technical Communication, No. 46. Harpenden (Eng.): Commonwealth Bureau of Soil Science, 1949, pp. 45-48.
- 'Grass Fires,' *Guam Recorder*, Vol. II (March, 1925), p. 10.
- 'Grass Varieties Introduced In Guam To Stimulate Grazing,' *Popular Mechanics Magazine*, Vol. XXXV (1921), p. 688.
- Grattan, C. Hartley. 'Japan's South Sea Islands,' *Asia*, Vol. XL (1940), pp. 320-322.
- _____. 'Those Japanese Mandates,' *Harper's Magazine*, Vol. CLXXXVIII (1944), pp. 145-153.
- Gray, George Robert. *Catalogue of the Birds of the Tropical Islands of the Pacific Ocean in the Collection of the British Museum, Department of Zoology*. London: British Museum, 1859.
- Great Britain Foreign Office. *Discoveries and Acquisitions in the Pacific*. London: H. M. Stationery Office, 1920.
- _____. *Former German Possessions in Oceania*. Handbook No. 146. London: H. M. Stationery Office, 1920.
- Green, Elizabeth. 'Pacific Trends: Japan's South Pacific Mandate,' *Pacific Affairs*, Vol. VI, pp. 197-203.
- Green, Marc T. 'Japan Looks South Too,' *Asia*, Vol. XXXVI (1936), pp. 303-307.
- Greenbie, Sydney. *The Pacific Triangle*. New York: The Century Co., 1921.
- Greene, Katrine, R. C. *Transportation, Part II. An Economic Survey of the Pacific Area*. New York: Institute of Pacific Relations, 1942.
- Gregory, H. E. 'Types of Pacific Islands,' *Proceedings of the Third Pan-Pacific Science Congress, Tokyo, 1926*, Vol. II (1927), pp. 1663-1673.
- Guam Agricultural Experiment Station. *Annual Reports, 1911-1932*. Washington: Government Printing Office.

- 'Guam Avocados,' *Guam Recorder*, Vol. XV (June, 1938), p. 29.
- 'Guam; Ladrone Islands,' *Mid-Pacific Magazine*, Vol. XI, (1916), pp. 157-160.
- 'Guam Museum Notes: Spanish Influence in Guam,' *Guam Recorder*, Vol. XIV (September, 1937), pp. 30-31.
- 'Guam Museum Notes: Historic Documents,' *Guam Recorder*, Vol. XIV (October, 1937), pp. 23, 36.
- Guerra, J. A. 'Die Marianen-Insel,' *Globus*, Vol. XLIV (1883), pp. 136-139.
- _____. *Viajes por Filipinas de Manila a' Marianas*, segunda edicion. Madrid: Imprenta de Fortanet, 1887.
- Guillou, Elie. *Voyage Autour Du Monde De L'Astrolabe Et De La Zelee, Du Contre-Amiral Dumont-D'Urville, 1837, 38, 39 Et 40*. Vol. I. Paris: Berquet et Petion, 1842.
- Guttenberg, B. 'The Structure of the Pacific Ocean as Indicated by Earthquakes,' *Science*, Vol. XC (1939), pp. 456-458.
- Haas, William H. (ed.) *The American Empire: A Study of the Outlying Territories of the United States*. Chicago: University of Chicago Press, 1940.
- Haie, William H. 'Hold the Pacific,' *New Republic*, Vol. CV (1941), pp. 394-396.
- Hall, Duncan H. *Mandates, Dependencies and Trusteeship*. Washington: Carnegie Endowment for International Peace, 1948.
- Hambidge, Gove. 'The New Insect-Killers,' *Harper's Magazine*, Vol. CXC (1945), pp. 264-268.
- Hansen, Donald J. 'Yap Chamorros Find New Home on Tinian,' *Guam News*, Vol. IV (May 23, 1948), p. 8.
- Hardy, Osgood. *A History of the Pacific Area in Modern Times*. Boston: Houghton Mifflin Co., 1949.
- Harris, Walter B. 'South Sea Islands under Japanese Mandate,' *Foreign Affairs*, Vol. X (1932), pp. 691-697.
- Hart, Thomas C. 'The United States and the Pacific Islands,' *Annals of the American Academy of Political and Social Science*, Vol. CCLV (1948), pp. 115-123.
- Hartwig, Georg. *Die Inseln des grossen Oceans in Natur und Volkerleben*. Wiesbaden: C. W. Kreidel, 1861.
- Haseba, Kotondo. 'Ruins and Relics of the Islands of Saipan and Tinian,' *Journal of the Anthropological Society of Tokyo*, Vol. XLIII (1928), pp. 243-274.

- Hassert, Kurt. *Die neuen Deutschen Erwerbungen in der Sudsee: Die Karolinen, Marianen und Samoa-Inseln.* Leipzig: Seele, 1903.
- Hatch, Spencer D. 'Rural Reconstruction in Mexico,' *Agriculture in the Americas*, Vol. IV (1944), pp. 51-53.
- Haushofer, Karl. *Geopolitik des Pacifischen Ozeans.* Heidelberg-Berlin: Vowenckel, 1938.
- Hawaii Agricultural Experiment Station. *Papaya Production in the Hawaiian Islands*, Bulletin No. 87. Honolulu: University of Hawaii, 1941.
- Hawkesworth, John. *An Account of the Voyages Performed by Byron, Wallis, Carterot, and Cook, Drawn up from the Journals*, Vol. I. London: W. Strahan and T. Cadell, 1773.
- Hayden, Joseph R. *Pacific Politics.* Minneapolis: University of Minnesota Press, 1937.
- Hayden, R. 'Malaya and the Philippines: Colonial Contrasts,' *Foreign Affairs*, Vol. V (1927), pp. 327-331.
- Henderson, W. O. 'Economic Aspects of German Imperial Colonization,' *Scottish Geographical Magazine*, Vol. LIV (1938), pp. 150-161.
- Heneman, Harlow J. 'Administration of Japan's Pacific Mandate,' *American Political Science Review*, Vol. XXV (1931), pp. 1029-1044.
- Hermann, R. 'Zur Statistik der Eingeborenen der deutschen Sudseegebiete,' *Zeitschrift fur Kolonialpolitik, Kolonialrecht und Kolonialwirtschaft*, Vol. XI (1909), pp. 550-568.
- Hess, H. H. 'Drowned Ancient Islands of the Pacific Basin,' *Annual Report of the Smithsonian Institution*, 1947. Washington: Government Printing Office, 1948, pp. 281-300.
- Higgins, Margaret M. 'Guam, Perch of the China Clippers,' *National Geographic Magazine*, Vol. LXXIV (1938), pp. 99-122.
- Hiraka, G. 'An Anthropological Study of the Micronesians,' *Proceedings of the Third Pan-Pacific Science Congress*, Tokyo, 1926, Vol. II. Tokyo: 1927, pp. 2399-2404.
- 'Historic Documents,' *Guam Recorder*, Vol. XV (1938), May, pp. 7-8; June, pp. 7-9; July, pp. 7, 38.
- Hitch, Thomas K. 'The Administration of America's Pacific Islands,' *Political Science Quarterly*, Vol. XLI (1946), pp. 384-407.
- Hobbs, William Herbert. *Earth Evolution and Its Facial Expression.* New York: Macmillan Co., 1921.
- _____. *Cruises Along By-Ways of the Pacific.* Boston: Stratford Press, 1923.

- Hobbs, W. H. *Fortress Islands of the Pacific*. Ann Arbor: J. W. Edwards, 1945.
- Holt, Ernest G. 'Conservation Program for the Trust Territory of the Pacific Islands.' Report presented at the Conference on Conservation in Micronesia held in Honolulu under the auspices of the Pacific Science Board, May, 1950. (Mimeographed.)
- Hornbostel, Gertrude. *Translation of Part of Chamisso's Works Relating to Guam*. Honolulu: Bernice P. Bishop Museum, MSS, DU - Pac. Pam. - 433.
- _____. 'Chamorro Names,' *Guam Recorder*, Vol. I (May, 1924), p. 16.
- _____. 'House of Taga,' *Guam Recorder*, Vol. I (January, 1925), p. 3.
- Hornbostel, Hans, G. 'Manuscript Notes.' Honolulu: Bernice P. Bishop Museum.
- _____. 'Notes on Saipan,' *Guam Recorder*, Vol. II (June, 1925), pp. 104, 113.
- _____. 'A Census of the Chamorro People,' *Guam Recorder*, Vol. II (October, 1926), p. 196.
- _____. 'Rota Days,' *Philippine Magazine*, Vol. XXXII (1935), pp. 129-130, 157-158, 184-185, 209-210, 287, 300-302, 380, 400-403.
- Hornbostel, Mr. and Mrs. H. G. 'Chamorro Locality Names,' *Guam Recorder*, Vol. II (February, 1926), p. 340.
- Hosaka, E. Y. 'Botanical Report on Micronesia,' *Economic Survey of Micronesia*, Vol. XIII, Part 2. Honolulu: U. S. Commercial Co., 1946. (Type-script, Library of Congress microfilm.)
- Hough, Frank O. *The Island War*. Philadelphia: J. B. Lippincott Co., 1947.
- 'How to Keep Farmers on the Farms,' *Guam Recorder*, Vol. XV (August, 1938), pp. 14-16, 36-37.
- Howell, G. C. L. *Ocean Research and the Great Fisheries*. Oxford: Clarendon Press, 1921.
- Hunt, Caspar. 'The Vanishing Arts of the South Sea Islands,' *Travel*, Vol. LXXXVI (1946), pp. 28-30.
- Ichara, Toyokichi. 'Investigation and Report on Rota Water Selection Phosphate.' Research report to the South Seas Development Company, June 13, 1938. Translation by Military Government. (Typewritten, University of Hawaii Library, Honolulu.)
- 'Imperialism in the Pacific,' *Christian Century*, Vol. LXI (1944), pp. 39-41.
- 'Island of Guam, Discovery, Occupation, and Missionary Work,' *Guam Recorder*, Vol. I (April, 1924), pp. 3-6.

- 'Island of Saipan,' *Guam Recorder*, Vol. II (March, 1925), p. 6.
- 'Islas Marianas ampliacion del informe dado al Gobierno Gral de Filipinas en 21 de Mayo de 1885 para cumplimentar la circular de dicho superior centro fecha 6 de Abril del mismo ano, recibida el 19 de Junio siguiente. August 21, 1885, Agana.' Library of Congress Manuscript Division, MSS, Ac 690 - No. 18.
- 'Islas Marianas. Informe emitido en cumplimiento del articulo 82 del Reglamento de 7 de Febrero de 1884, para la ejecucion del Real Decreto de 12 de Julio de 1883 sobre la prestacion personal e impuesto provincial. April 17, 1886, Agana.' Library of Congress Manuscript Division, MSS, Ac 690 - No. 13.
- Jacobs, Woodrow S. 'Sources of Atmospheric Heat and Moisture over the North Pacific Ocean and the North Atlantic Ocean,' *Annals New York Academy of Science*, Vol. XLIV (1943), pp. 19-40.
- Japanese Government. General Information on the Saipan Branch of the Japanese South Seas Bureau. Translation, Headquarters of the Commander in Chief, U. S. Pacific Fleet and Pacific Ocean Areas, Pearl Harbor, CINCPAC. (Typewritten.)
- Japanese Government, South Seas Bureau. *Annual Reports to the League of Nations*, 1920-1936. Tokyo.
- Japanese Government, Saipan Branch Administrative Office. *Descriptive Outline of Saipan*, 1938. Translation, Allied Translator and Interpreter Section, South Pacific Area. Enemy Publications No. 42, September 19, 1943. Central Intelligence Agency, Washington. Document No. 157.453.
- 'Japanese Oceania,' *Commonweal* (N. Y.), Vol. XXXV (1942), p. 597.
- 'Japan's South Pacific Mandate,' *Pacific Affairs*, Vol. VI (1933), pp. 196-203.
- Jung, Emil. 'Die Deutsch Marianen,' *Deutsche Kolonialzeitung*, Vol. XVI (1899), pp. 330-331.
- 'Junior Agricultural Fair,' *Guam Recorder*, Vol. XVI (April, 1939), p. 26.
- Kanehira, Ryozo. *An enumeration of Woody Plants Collected in Micronesia*. Tokyo: Japanese Mandate, 1931.
- _____. 'The Forests of Micronesia, Japanese Mandate,' *Tropical Woods*, Vol. XXIX (1932), pp. 1-6.
- _____. 'On the Flora of Micronesia,' *Bulletin of the Biogeographical Society of Japan*, Tokyo, Vol. V (1935), pp. 260-262.
- _____. 'On the Distribution of Pandanus and the Geographic Relationships of the Micronesian Species,' *Bulletin of the Biogeographical Society of Japan*, Tokyo, Vol. VI (1935), pp. 11-18.

- Kanehira, Ryoza. 'On the Phytogeography of Micronesia,' *Proceedings Sixth Pacific Science Congress, Berkeley*, Vol. IV, pp. 595-611. Berkeley: University of California Press, 1940.
- Keesing, F. M. 'Changing Life of Native Peoples in the Pacific Area,' *American Journal of Sociology*, Vol. XXXIX (1934), pp. 443-458.
- _____. 'Standards of Living Among Native Peoples of the Pacific,' *Pacific Affairs*, Vol. VIII (1935), pp. 21-34.
- _____. 'Hour of Destiny in the South Sea Islands,' *Asia*, Vol. XLI (May, 1941), pp. 245-248.
- _____. 'South Seas Change,' *Asia*, Vol. XLI (June, 1941), pp. 274-277.
- _____. 'Extension Work in the Pacific Islands,' *Rural Sociology*, Vol. IX (1944), pp. 311-327.
- _____. 'The Former Japanese Mandated Islands,' *Far Eastern Survey*, Vol. XIV (1945), pp. 269-271.
- _____. *Native Peoples of the Pacific World*. New York: Macmillan Co., 1945.
- _____. *The South Seas in the Modern World*. New York: John Day Co., 1945.
- _____. 'Administration in Pacific Islands,' *Far Eastern Survey*, Vol. XVI (1947), pp. 61-65.
- Keesing, Marie M. *Pacific Islands in War and Peace*. Institute of Pacific Relations Pamphlet No. 14. New York: Institute of Pacific Relations, 1944.
- Keyser, H. 'Climatological Data on the Pacific Ocean,' *Proceedings Sixth Pacific Science Congress, Berkeley*, 1939, Vol. III, pp. 691-696. Berkeley: University of California Press, 1940.
- Kirk, Grayson. 'Wings Over the Pacific,' *Foreign Affairs*, Vol. XX (1942), pp. 293-302.
- Kirkpatrick, C. 'American Bases and American Policy - Pacific Ocean Area,' *Pacific Islands*, ed. by Earl Swisher. Boulder (Colorado): University of Colorado, 1946.
- Knox, H. Gard, Harris, Frederic R., and Kimmel, Husband E. 'Naval Bases -- Past and Future,' *U. S. Naval Institute Proceedings*, Vol. LXXI (1945), pp. 1147-1153.
- Koelliker, O. 'Kurs der Magellanschen Flotte,' *Petermanns Mitteilungen*, Vol. LVIII (1912), p. 335.

- Kotzebue, Otto. *A Voyage of Discovery into the South Sea and Beering's Strait, for the Purpose of Exploring a Northeast Passage in the Years 1815 - 1818*, Vols. II, III. London: Longman, Hurst, Rees, Orme, and Brown, 1821.
- Krieger, Herbert W. *Island Peoples of the Western Pacific, Micronesia and Melanesia*. War Background Studies No. 16. Washington: Smithsonian Institution, 1943.
- Kuroda, Nagamichi. 'A Study of the Marianas Duck,' *Tori*, Vol. XI (October, 1941), pp. 99-119; (December, 1942), pp. 443-448.
- Laborde, Edward D. (ed.). *Australia, New Zealand, and the Pacific Islands*. London: William Heinemann, Ltd., 1932.
- Ladejinsky, Wolf I. 'Island Agriculture in the South Pacific,' *Foreign Agriculture*, Vol. VII (1943), pp. 178-184.
- 'Ladrone Islands,' signed 'Blue Water,' *Friend*, Vol. V (1847), p. 189.
- Lake, P. 'Island Arcs and Mountain Building,' *Geographical Journal*, Vol. LXXVIII (1931), pp. 149-160.
- Lambert, S. M. *The Depopulation of the Pacific Races*. Bernice P. Bishop Museum Special Publication 23. Honolulu: Bishop Museum Press, 1934.
- Lang, Harry, Jr. 'Report on the Control of the Mariana Coconut Beetle and the Giant African Snail.' U. S. Navy Department Civil Administration Unit, Saipan Quarterly Report, October 1 - December 31, 1947.
- _____. 'The Biology of the Mariana Coconut Beetle on Saipan, and the Introduction of Parasites from Malaya and Java for Its Control,' *Proceedings Hawaiian Entomological Society*, Vol. XIV (1950), pp. 143-162.
- Lang, John Dunmore. *Origin and Migrations of the Polynesian Nation Demonstrating their Original Discovery and Progress in Settlement of the Continent of America*. London: James Cochrane and Co., 1934.
- _____. *Origin and Migrations of the Polynesian Nation*. London: Sampson, Low, Marston, and Searle, 1877.
- Langford, Daniel B. 'Investigation Concerning the African Snail, U. S. Commercial Memorandum, POA - 60. Honolulu: U. S. Commercial Co., 1946. (Mimeographed.)
- Leigh, R. W. *Dental Morphology and Pathology of Prehistoric Guam*. Memoirs of the Bernice P. Bishop Museum, Vol. XI, No. 3. Honolulu: Bishop Museum Press, 1929.
- Lemery, Jose and others. 'Correspondence, Orders, etc. of the Governors of the Philippines Sent to the Marianas, Feb. 15, 1861-Dec. 14, 1865.' Library of Congress Manuscript Division, MSS, Ac 508 - Box 4.

- Letter from Agricultural Experiment Station to Governor Price, *Guam Recorder*, Vol. II (June, 1925), pp. 99-100.
- Levi, W. 'United States and Pacific Bases,' *Fortnightly*, Vol. CLXVI (1946), pp. 165-171.
- Lewin, Evans. *The Pacific Region. A Bibliography of the Pacific and East Indian Islands, exclusive of Japan*, Royal Empire Society Bibliography No. 11. London: Royal Empire Society, 1944.
- Lindley, E. K. 'Trusteeship or Annexation,' *Newsweek*, Vol. XXVII (February 18, 1946), p. 34.
- Linton, Ralph. *Ethnology of Polynesia and Micronesia*. Field Museum of Natural History Guide, Part 6. Chicago: Field Museum, 1926.
- Linton, Ralph, and Wingert, Paul S. *Arts of the South Seas*. New York: Simon and Schuster, 1946.
- Litke, F. P. *Voyage autour du monde, sur la Corvette le Seniavine, dans 1826-1829*, Tomes 1-3 and atlas. Vols. II, III. Paris: De Firmin Didot Freres, 1835-36.
- Littlehales, G. W. 'Configuration of the Ocean Basins,' *Bulletin of the National Research Council*, Vol. LXXXV (1932), pp. 13-46.
- Louderback, George D. *Fundamental Geological Problems of the North Pacific Ocean Region*. Scripps Institution for Biological Research of the University of California, Bulletin No. 9. Berkeley: University of California, 1919, pp. 75-82.
- Loveride, Arthur. *Reptiles of the Pacific World*. Washington: Infantry Journal Press, 1945.
- Luke, Sir Harry C. *The British Pacific Islands*. London: Oxford University Press, 1943.
- Maanen-Helmer, Elizabeth van. *The Mandates System in Relation to Africa and the Pacific Islands*. London: P. S. King and Son, 1929.
- Marchand, Etienne. *Voyage autour du monde, 1790, 1791, 1792*, Vol. I. Paris: De L'Imprimerie De La Republique, 1796.
- Mark, William D. 'Report on the Mineral Deposits of Micronesia,' *An Economic Survey of Micronesia*, Vol. III. Honolulu: U. S. Commercial Company, 1946. (Typescript, Library of Congress microfilm.)
- _____. 'Memorandum on the Suitability of Rota Phosphate for Direct Application to the Soil.' Memorandum to Douglas L. Oliver, Representative of the U. S. Commercial Company, Honolulu, June 12, 1946.
- _____. 'Phosphate and Manganese Ore Deposits on Rota, M. I.' Report to the U. S. Commercial Company, Honolulu, 1946. (Typewritten.)

- Marshall, Joe T., Jr. 'The Endemic Avifauna of Saipan, Tinian, Guam, and Palau,' *Condor*, Vol. LI (1949), pp. 200-221.
- Marshall, P. 'General Statement on the Structure of the Pacific Region,' *Proceedings of the Pan-Pacific Science Congress, Melbourne and Sydney*, Vol. I, 1923. Melbourne: Government Printer, 1924. pp. 730-734.
- Martire, Vincent, and Hathaway, Hanson. 'Bringing a New Deal to Saipan,' *Travel*, Vol. LXXXVII (1946), pp. 24-25, 33.
- Mason, Leonard. 'Trusteeship in Micronesia,' *Far Eastern Survey*, Vol. XVII (1948), pp. 105-108.
- Matsumura, Akira. 'Contributions to the Ethnography of Micronesia,' *Journal of the College of Science; Imperial University, Tokyo*, Vol. XL (1917-1918), pp. 1-174. (In Japanese.)
- Mayr, Ernst. 'Bird Conservation Problems in the Southwest Pacific,' *Audubon Magazine*, September-October, 1945, pp. 279-282.
- _____. *Birds of the Southwest Pacific*. New York: Macmillan Co., 1945.
- McCullough, F. E., and Angeny, G. L. 'Guam Reports on Health and Sanitation for the Years 1907-1908,' *U. S. Naval Medical Bulletin*, Vol. III (1909), pp. 321-333.
- McDonald, A. H. (ed.). *Trusteeship in the Pacific*. Sydney: Angus and Robertson, 1949.
- MacFadden, Clifford H. *A Bibliography of Pacific Area Maps*. New York: Institute of Pacific Relations, 1941.
- McIntosh, Lt. Commander K. C. 'The People of Beforetime,' *Guam Recorder*, Vol. II (1925), March, pp. 3, 14-16; April, pp. 37, 48-49.
- MacMillan, Howard. 'Report on Agricultural Conditions in Micronesia,' *Economic Survey of Micronesia*, Vol. XI. Honolulu: U. S. Commercial Co., 1946. (Typescript, Library of Congress microfilm.)
- Mears, E. *The Pacific Ocean Handbook*. Palo Alto: Stanford University Press, 1944.
- Medina, J. T. *Fernando de Magallanes*. Santiago (Chile): Imprenta Universitaria, 1920.
- _____. *El descubrimiento del Oceano pacifico*, Vols. I, II, III. Santiago (Chile): Imprenta Universitaria, 1913-1930.
- Medinilla y Pineda, Jose de (Gov. of the Marianas) and others. 'Copies de cartas de Oficios y Consultas durante el tiempo que Governo estas Yslas el S'or Dn Jose de Medinilla, y Pineda, Dec. 7, 1818 - Sept. 13, 1822, Ygnacio de Agana.' Library of Congress Manuscript Division, MSS, Ac 508 - Box 24.

- Medinilla y Pineda, Jose de and others. 'Bandos correspondientes al ano de 1829. May 29, 1829-Oct. 13, 1829. San Ygnacio de Agana.' Library of Congress Manuscript Division, MSS, Ac 508 - Box 11.
- 'Meeting of the Guam Chamber of Commerce: Lack of Productivity in Guam,' *Guam Recorder*, Vol. I (June, 1924), p. 7.
- Meiniche, Earl Edward. *Die Inseln des stillen Oceans*, Vols. I and II. Leipzig: Baldamus, 1888.
- Meissner, H. O. 'Die Marianen und West-Karolinen unter Japanischen Mandat,' *Koloniale Rundschau*, Vol. XXIX (1932), pp. 342-351.
- Merrill, Elmer D. 'An Enumeration of the Plants of Guam,' *The Philippine Journal of Science*, Vol. IX, Section C (1914), pp. 17-95.
- _____. *Plant Life of the Pacific World*. New York: Macmillan Co., 1946.
- _____. *A Botanical Bibliography of the Islands of the Pacific*, Smithsonian Contributions from the United States National Herbarium, Vol. XXX, Part I. Washington: Government Printing Office, 1947.
- 'Minutes of the Fourth Annual Meeting of the Insect Control Committee on Micronesia,' Honolulu, March 9-10, 1950. Honolulu: Pacific Science Board, 1950. (Mimeographed.)
- Moley, R. 'Security in the Pacific,' *Newsweek*, Vol. XXV (May 7, 1945), p. 112.
- Moncada, Antonio and others. 'Yslas Marianas. Ynforme sobre la visita girada a los pueblos de la Isla de Guajan, May 21, 1885.' Library of Congress Manuscript Division, MSS, Ac 690 - No. 5.
- Montero y Vidal, D. Jose. *El Archipelago Filipino y las Islas Marianas, Carolinas y Palaos*. Madrid: Imprenta y Fundicion de Manuel Tello, 1886.
- Moore, W. Robert. 'Pacific Wards of Uncle Sam,' *National Geographic*, Vol. XCIV (1948), pp. 73-104.
- Muro, Manuel (Gov. of the Marianas). 'Edicts, decrees, etc. concerning the Marianas Islands, Sept. 5, 1794 - Dec. 7, 1801. San Yganacio de Agana.' Library of Congress Manuscript Division, MSS, Ac 508, Box 11.
- Murphy, Raymond E. ''High' and 'Low' Islands in the Eastern Carolines,' *Geographical Review*, Vol. XXXIX (1949), pp. 425-439.
- Myers, George. 'The Fish Fauna of the Pacific Ocean with Special Reference to Zoogeographical Regions and Distribution as They Affect the International Aspect of Fisheries,' *Proceedings Sixth Pacific Science Congress*, Berkeley, 1939, Vol. III. Berkeley: University of California Press, 1940, pp. 201-210.

- Nakamura, Michitaro. *Dai Tokyo Zumanshoto Inin Toji Nanyo*. (Greater Tokyo, The Seven Islands of Izu, Ogasawara Islands and the South Seas Mandated Islands), Vol. VII. *Nippon Chirifuzoku Taikei*. (An Outline of the Geography and Customs of Japan.) Tokyo: Zoho Han, Seimondo Shinkosha, 1937.
- Nanyocho, Chokan Kambo Bunshoka. (Japanese South Seas Bureau, Chief Secretariat). *Nanyo Gunto Tosei Chosa Sho*. (An Analysis of the Condition of the Japanese Mandated Islands.) Tokyo: Gyosie Gakukai Insatsu Sho, 1937.
- Nanyocho, Nanyo Gunto Yoran. *An Outline of the South Sea Islands*. Tokyo: Kogyo Kan, 1936.
- Nelson, Evelyn G., and Nelson, Frederick J. 'Lonely Guam,' *Asia*, Vol. XXXVI (1936), pp. 173-176.
- Nelson, Frederick K. 'Guam: Our Western Outpost,' *U. S. Naval Institute Proceedings*, Vol. LXVI (1940), pp. 83-96.
- _____. 'Typhoons Over Guam,' *U. S. Naval Institute Proceedings*, Vol. LXVII (1941), pp. 237-249.
- Nelson, Frederick J., and Nelson, Evelyn G. 'Guam - Pacific Outpost,' *Asia*, Vol. XLI (1941), pp. 299-302.
- 'Newly Discovered Latte,' *Guam Recorder*, Vol. XV (July, 1938), pp. 15, 30.
- Nichols, John T., and Bartsch, Paul. *Fishes and Shells of the Pacific World*. Washington: The Infantry Journal, 1945.
- Oakley, O. A. 'Agriculture in Guam,' *Foreign Agriculture*, Vol. VIII (1944), pp. 215-224.
- Oakley, R. G. 'Entomological Observations in the Marshall, Caroline, Mariana Islands,' *Economic Survey of Micronesia*, Vol. XIV, Part 2. Honolulu: U. S. Commercial Co., 1946. (Typescript, Library of Congress microfilm.)
- Ohkubo, Takeo. 'The Pacific Air Routes,' *Bulletin of the South Sea Association*, Vol. IV (1941), pp. 9-19.
- Ohrt, Frederick. 'Water Development and Salt Water Intrusion on Pacific Islands.' *Journal American Water Works Association*, Vol. XXXIX (1947), pp. 979-988.
- 'Origin of the Name Chamorro,' *Guam Recorder*, Vol. XV (January, 1939), p. 36.
- Osborn, Fairchild. *The Pacific World*. New York: W. W. Norton and Co., 1944.
- Osborne, Douglas. 'Archaeology on Guam: A Progress Report,' *American Anthropologist*, Vol. XLIX (1947), pp. 520-524.

- Ouwelant, J. J. 'Coffee,' *Guam Recorder*, Vol. XII (January, 1936), pp. 276-277.
- _____. 'Sugar Cane,' *Guam Recorder*, Vol. XII (March, 1936), pp. 330, 347.
- 'Pacific Bastions,' *Newsweek*, Vol. XXVIII (November 18, 1946), p. 40.
- 'Pacific Price Index,' *Time*, Vol. LXIV (December 11, 1944), p. 64.
- Palmer, F. 'Our Pacific Bases: Think Twice,' *Harper's Magazine*, Vol. CXCI (1943), pp. 419-423.
- 'The Papaya,' *Guam Recorder*, Vol. I (October, 1924), p. 7.
- Parrilla, Justo P. *Conflicto Hispano-Aleman, Descripcion Geografico-Historica de las Islas Marianas y Carolinas*. Habana: Calle de O'Reilly, 1885.
- Pastor, Father. 'The First Typhoon Recorded in Guam,' *Guam Recorder*, Vol. XV (April, 1938), pp. 18-19.
- _____. 'Newly Discovered Latte,' *Guam Recorder*, Vol. XV (July, 1938), pp. 15, 30.
- _____. 'Population of the Marianas Islands in Early Times,' *Guam Recorder*, Vol. XV (February, 1939), pp. 24, 41-42.
- Perez, L. G. Perez, and Torres, J. 'Customs and Legends of Guam,' *Guam Recorder*, Vol. XIII (November, 1936), p. 13.
- Perouse, Jean Francois. *A Voyage Round the World, Performed in the Years 1785, 1786, 1788 by the 'Boussole' and 'Astrolabe' under the command, of J. F. G. de la Perouse*, Vol. I. London: G. C. and J. Robinson; J. Edwards; and Payne, 1799.
- Perry, Commander John R. 'Coral, our Pacific Lifesaver,' *Military Engineer*, Vol. XXXVII (1945), pp. 168-175.
- Perry, W. J. 'The Origin of Oceanic Culture,' *Proceedings of the Pan-Pacific Science Congress*, Melbourne and Sydney, 1923, Vol. I. Melbourne: Government Printer, 1924, pp. 227-230.
- P. F. D. 'First Official Governor of the Marianas,' *Guam Recorder*, Vol. XVI (April, 1939), p. 26.
- Phillips, James T. 'Notes on the Caroline, Marshall, Mariana and Palau Islands.' Honolulu: Chamber of Commerce, 1944. (Mimeographed.)
- Phillips, Joseph D. 'Foreign Trade,' Part II. *An Economic Survey of the Pacific Area*. New York: Institute of Pacific Relations, 1942.

- Piper, Arthur A. 'Water Resources of Guam and the Ex-Japanese Islands of the Western Pacific,' *Economic Survey of Micronesia*, Vol. IV. Honolulu: U. S. Commercial Company, 1946. (Typescript, Library of Congress microfilm.)
- 'Poultry Raising in Guam.' Letter to the Governor of Guam from Office of the Agricultural Experiment Station. *Guam Recorder*, Vol. II (June, 1925), pp. 99-101, 106.
- Pratt, F. 'Turkey-Shoot on Saipan,' *Harper's Magazine*, Vol. CLXC (1945), pp. 541-555.
- _____. 'The Big Pacific Push,' *Harper's Magazine*, Vol. CXC (1945), pp. 635-645.
- 'Present State of Coconut Investation,' *Guam Recorder*, Vol. I (February, 1925), p. 7.
- Price, Willard. 'Mysterious Micronesia,' *National Geographic*, Vol. LXIX (1936), pp. 441-510.
- _____. *Pacific Adventure*. New York: Reynal and Hitchcock, 1936.
- _____. 'The Pacific Changes Color,' *Asia*, Vol. XXXVI (1936), pp. 574-578.
- _____. *The South Sea Adventure*. Tokyo: Hokuseido Press, 1936.
- _____. 'Mistress of the Yellow Seas,' *Fortnightly Review*, Vol. CXLVIII (1937), pp. 523-533.
- _____. 'Future of Japan's Islands,' *Nation*, Vol. CLVIII (1944), pp. 358-360.
- _____. 'Spying on Japan's Island Strongholds,' *Travel*, Vol. LXXXII (1944), pp. 10-14.
- _____. 'Will the Pacific be Brown or Yellow?' *Natural History*, Vol. LIII (1944), pp. 120-127.
- _____. *Japan's Islands of Mystery*. New York: John Day Company, 1944.
- _____. 'Japan's Islands of Mystery,' *Saturday Evening Post*, Vol. CCXIV (April, 1945), pp. 26-27.
- Prieto, Jose and others. 'Copia de la Memoria de las Yslas Marianas, Dec. 31, 1890, Agana.' Library of Congress Manuscript Division, MSS, Ac 690, No. 2.
- Prowazek, Stanislaus von. *Die Deutschen Marianen, Ihre Natur und Geschichte*. Leipzig: Barth, 1931.

- Rachlis, E. 'Navy Rule in the Pacific,' *New Republic*, Vol. CXV (1946), pp. 755-756.
- 'Recommendations and Selected Papers.' Honolulu Conference on Conservation in Micronesia held under the auspices of the Pacific Science Board of the National Research Council at the University of Hawaii and the Bernice P. Bishop Museum, Honolulu, April 19-20, 1948. Honolulu: Pacific Science Board, 1948. (Mimeographed.)
- Reed, W. W. 'Climatological Data for the Tropical Islands of the Pacific Ocean,' *Monthly Weather Review*, Vol. LV (1927), p. 127.
- 'Reforestation,' *Guam Recorder*, Vol. I (November, 1924), p. 42.
- Reid, Charles F. *Bibliography of the Island of Guam*. New York: H. W. Wilson Co., 1939.
- Repetti, Rev. W. C. 'Seismicity of the Island of Guam,' *Guam Recorder*, Vol. XII (November, 1935), p. 210.
- _____. 'The Manila Galleon at Guam in 1669,' *Guam Recorder*, Vol. XVII (July, 1940), p. 157.
- _____. 'A seventeenth Century Letter from the Island of Rota,' *Guam Recorder*, Vol. XVII (November, 1940), pp. 319-320.
- _____. 'A Letter from Saipan in 1684,' *Guam Recorder*, Vol. XVII (March, 1941), pp. 494-496, 520-521.
- Ripperton, J. C. 'Report on Some Agricultural Aspects of Micronesia,' *Economic Survey of Micronesia*, Vol. XVII. Honolulu: U. S. Commercial Company, 1946. (Typescript, Library of Congress microfilm.)
- Roberts, Stephen H. *Population Problems of the Pacific*. London: George Routledge and Sons, 1927.
- Robertson, James Alexander. *Magellan's Voyage Around the World by Antonio Pigafetta*, Vol. I. Cleveland: Arthur H. Clark Co., 1906.
- Robson, R. W. *Pacific Islands Handbook*. New York: Macmillan Co., 1945.
- Rogers, Oliver C. 'Report on the Soils of Micronesia,' *Economic Survey of Micronesia*, Vol. XII. Honolulu: U. S. Commercial Company, 1946. (Typescript, Library of Congress microfilm.)
- Rowe, David Nelson. 'Collective Security in the Pacific,' *Pacific Affairs*, Vol. XVIII (1945), pp. 5-21.
- Rowley, W. W. 'Looking Back, Those Early Days of American Occupation,' *Guam Recorder*, Vol. XIII (November, 1936), pp. 6-7, 33.
- _____. *Pictorial Review and Historical Sketch of the Island of Guam, 1521-1928*. Agana (Guam): *Guam Recorder*, 1928.

- 'Running Water for Saipan,' *Popular Science*, Vol. LXXXV (1946), pp. 28-30.
- Sabtos, Luis (Governor of the Marianas), and others. 'Copia de la Memoria de las Yslas Marianas, Dec. 31, 1891, Agana.' Library of Congress Manuscript Division, MSS, Ac 690, No. 3.
- Safford, William E. 'The Mariana Islands.' Notes composed from documents in the archives at Agana, Guam, and from early voyages found in the libraries of San Francisco, 1901.' Library of Congress Manuscript Division.
- _____. 'Guam and Its People,' *American Anthropologist*, Vol. IV, New Series (1902), pp. 707-729.
- _____. 'Guam and Its People,' *Annual Report of the Smithsonian Institution*, 1902. Washington: Government Printing Office, 1903, pp. 493-508.
- _____. 'Extracts from the Notebook of a Naturalist on the Island of Guam,' *Plant World*, Vol. VII (1904), pp. 1-8.
- _____. 'Our Smallest Possession -- Guam,' *National Geographic*, Vol. XVI (1905), pp. 229-237.
- _____. 'The Useful Plants of the Island of Guam,' *Contributions from the United States National Herbarium*, Vol. IX. Smithsonian Institution. Washington: Government Printing Office, 1905.
- _____. *A Year on the Island of Guam*. Washington: H. L. McQueen, 1911.
- St. John, Harold. 'Tinian Plants Collected by R. S. Cowan,' *Pacific Plant Studies* No. 5. *Bulletin of the Torrey Botanical Club*, Vol. LXXIII (1946), p. 588.
- Sanchez, Adriano C. 'How To Keep Farmers On The Farms,' *Guam Recorder*, Vol. XV (July, 1938), pp. 18-20, 26.
- Schnee, Heinrich (ed.). *Deutsches Kolonial-Lexicon*, Vols. I, II, III. Leipzig: Quelle and Meyer, 1920.
- Schnee, P. 'Die verwilderten Haustiere auf Tinian,' *Zeitschrift fur Kolonial-Politik, Kolonialrecht und Kolonialwirtschaft*, Vol. XIII (1911), pp. 350-362.
- _____. 'Bilder aus den Karolinen und Marianen,' *Zeitschrift fur Kolonial-Politik, Kolonialrecht und Kolonialwirtschaft*, Vol. XIV (1912), pp. 610-629.
- Schott, G. *Geographie des Indischen und Stillen Ozeans*. Hamburg: C. Boysen, 1935.
- Schumann, Karl M., and Lauterback, K. *Nachtrage zur Flora der deutschen Schutzgebiete in der Sudsee*, Vols. I and II. Leipzig: Gebruder Borntraeger, 1901-1905.

- Scott, Ken. 'Notes on Saipan Birds,' *Auk*, Vol. LXIV (1947), pp. 523-527.
- Seale, Alvin. 'Report of a Mission to Guam,' *Occasional Papers of the Bernice P. Bishop Museum*, Vol. I, No. 3. Honolulu: Bishop Museum Press, 1901, pp. 17-128.
- _____. 'Fishes of the South Pacific,' *Occasional Papers of the Bernice P. Bishop Museum*, Vol. IV, No. 1. Honolulu: Bishop Museum Press, 1906.
- Searles, P. J. 'Mystery Monuments of the Marianas,' *Scientific Monthly*, Vol. XXV (1927), pp. 385-391.
- _____. 'The Most Valuable Tree in the World,' *Scientific Monthly*, Vol. XXVII (1928), pp. 271-280.
- Searles, Paul J., and Searles, Ruth. *A School History of Guam*. Agana (Guam): Naval Government Print Shop, 1937.
- Seidel, H. 'Saipan, die Hauptinsel der deutschen Marianen,' *Globus*, Vol. LXXXVI (1904), pp. 278-282.
- _____. 'Die Bevolkerung der deutschen Marianen,' *Deutsche Rundschau*, Vol. XXIX (1907), pp. 193-206.
- _____. 'Die Insel Tinian und ihre Stellung in Marianen-Bogen,' *Geographische Zeitschrift*, Vol. XX (1914), pp. 558-567.
- _____. 'Die Deutsche Marianen Insel Rota,' *Deutsche Rundschau fur Geographie*, Vol. XXXVII (1914), pp. 145-155.
- Setchell, W. A. 'Migration and Endemism with Reference to Pacific Insular Flora,' *Proceedings of the Third Pan-Pacific Science Congress*, Tokyo, 1926, Vol. I. Tokyo: 1927, pp. 869-875.
- Shapiro, Harry L. 'Peoples of the Pacific,' *Natural History*, Vol. LIII (1944), pp. 166-181.
- Shephard, C. Y. *Report on Agricultural Policy for Fiji and the Western Pacific High Commission Territories*, Suva: Government Printer, 1944.
- Smith, Clifford. 'America and the Pacific Islands,' *American Perspective*, Vol. II (1948), pp. 243-253.
- Smith, Robert O. 'Survey of Fisheries of the Former Japanese Mandated Islands,' *Economic Survey of Micronesia*, Vol. X. Honolulu: U. S. Commercial Company, 1946. (Typescript, Library of Congress microfilm.)
- _____. *Survey of the Fisheries of the Former Japanese Mandated Islands*, Fishery Leaflet 273. Washington: Fish and Wildlife Service, 1947.

- Smith, R. O. *Fishery Resources of Micronesia*, Fishery Leaflet 239. Washington: Fish and Wildlife Service, 1947.
- Smith, Sydney Bernard. 'Air Transport in the Pacific Area.' New York: Institute of Pacific Relations, 1941. (Mimeographed.)
- South Seas Association. *South Seas Studied Economically, Culturally, etc.* Tokyo: South Seas Association, 1939.
- Sparhawk, W. N. 'Notes on Forests and Trees of the Central and Southwest Pacific Area.' Washington: U. S. Department of Agriculture, Forest Service, 1945. (Mimeographed.)
- Stearns, Harold T. 'Shore Benches on North Pacific Islands,' *Bulletin of the Geological Society of America*, Vol. LII (1941), pp. 773-780.
- _____. 'Eustatic Shorelines of the Pacific,' *Bulletin of the Geological Society of America*, Vol. LVI (1945), pp. 1071-1078.
- Stearns, Harold T. 'Late Geologic History of the Pacific Basin,' *American Journal of Science*, Vol. CCXLIII (1945), pp. 614-626.
- _____. 'Water for the Invasion of Saipan,' *Military Engineer*, Vol. XXXVII (1945), pp. 96-98.
- _____. 'An Integration of Coral-Reef Hypothesis,' *American Journal of Science*, Vol. XXIV (1946), pp. 245-262.
- Stearns, Norah D. 'Pillow-Lavas of Guam,' *Guam Recorder*, Vol. XIV (February, 1938), pp. 7-8.
- _____. 'Dike Rocks of Guam,' *Guam Recorder*, Vol. XV (January, 1939), pp. 8-9.
- Stewart, J. F. 'The Restitution of the German Colonies,' *Scottish Geographical Magazine*, Vol. LIV (1938), pp. 19-28.
- Stewart, R. L. 'Plant Protection in the Belgium Congo,' *Scientific Monthly*, Vol. XLIII (1946), pp. 268-280.
- Stott, Frédéric A. *Saipan under Fire*. Andover (Mass.): Frederic A. Stott, 1945.
- Stott, Ken, Jr. 'Notes on Saipan Birds,' *Auk*, Vol. LXIV (1947), pp. 523-527.
- Strong, W. M. 'Health Conditions in the Pacific Islands. Report of the League of Nations Mission, No. C. H. 829. Geneva: League of Nations, 1929.
- Strophlet, John J. 'The Birds of Guam,' *Auk*, Vol. LXIII (1946), pp. 534-540.
- Sugiura, Kenichi. 'Ethnology and Native Administration in Micronesia.' Translation prepared for the U. S. Commercial Co., Honolulu, 1946.

- Swisher, Earl (ed.). *Pacific Islands. A Group of Papers on Post-War Problems of the Islands of the Pacific*, Institute of Asiatic Affairs. Boulder (Colorado): University of Colorado, 1946.
- Tayama, Risaburo. 'Coral Reefs in the South Seas,' *Proceedings of the Imperial Academy*, Tokyo: Vol. XI (1935), pp. 326-328.
- _____. 'Insular Disposition and Submarine Topography of the South Sea Islands,' *Japanese Journal of Geology and Geography*, Vol. XVI (1939), pp. 21-23.
- _____. 'On the Crustal Movement of the Western Submarine Ridges and Islands in the South Sea under Japanese Mandate,' *Japanese Journal of Geology and Geography*, Vol. XVI (1939), pp. 23-24.
- _____. 'Topography, Geology and Coral Reef of Tinian Island,' *Japanese Journal of Geology and Geography*, Vol. XVI (1939), pp. 30-31.
- Tayama, Risaburo. 'Topography, Geology, and Coral Reef of Saipan,' *Japanese Journal of Geology and Geography*, Vol. XVI (1939), pp. 32-33.
- _____. 'Terraces of the South Sea Islands under the Japanese Mandate,' *Japanese Journal of Geology and Geography*, Vol. XVII (1940), pp. 51-52.
- _____. 'Topography, Geology, and Coral Reef of Saipan.' Translation of a report found on Saipan during the invasion. Available at Civil Administration Unit, Saipan.
- Taylor, J. L. 'Geography of the Marianas.' Saipan: Education Office, Military Government Section, 1945. (Mimeographed.)
- Thompson, Homer G. *Vegetable Crops*. New York: McGraw Hill Co., 1949.
- Thompson, Laura. *Archaeology of the Mariana Islands*. Bernice P. Bishop Museum Bulletin No. 100. Honolulu: Bishop Museum Press, 1932.
- _____. 'The Function of Latte in the Marianas,' *Journal of the Polynesian Society*, Vol. XLIX (1940), pp. 447-463.
- _____. 'Fishing in Guam,' *Guam Recorder*, Vol. XVIII (May, 1941), pp. 54-56, 80-81.
- _____. 'Guam: Study in Military Government,' *Far Eastern Survey*, Vol. XIII (1944), pp. 149-154.
- _____. *The Native Culture of the Marianas Islands*. Bernice P. Bishop Museum Bulletin 185. Honolulu: Bishop Museum Press, 1945.
- _____. *Guam and Its People*. Princeton: Princeton University Press, 1947.
- _____. 'The Basic Conservation Problem,' *Scientific Monthly*, Vol. XLVIII (1949), pp. 129-131.

- Thompson, L. 'Action Research Among the American Indians,' *Scientific Monthly*, Vol. LXX (1950), pp. 34-40.
- Thompson, Warren S. *Population and Peace in the Pacific*. Chicago: University of Chicago Press, 1946.
- Thomson, J. Earle. *Our Pacific Possessions*. New York: Charles Scribner's Sons, 1931.
- Thorne, M. D. 'Erosion Characteristics of Micronesian Soils.' Honolulu: Pineapple Research Institute, 1948. (Mimeographed.)
- Tokuda, Sadakazu. 'On the Echelon Structure of the Japanese Archipelagoes,' *Japanese Journal of Geology and Geography*, Vol. V (1926-1927), pp. 41-76.
- Townes, Henry. 'Results of an Entomological Inspection Tour of Micronesia,' *Economic Survey of Micronesia*, Vol. XIV. Honolulu: U. S. Commercial Company, 1946. (Typescript, Library of Congress microfilm.)
- 'Translation of Extracts from a Book by Yawata Aso.' Translation No. 399. Washington Far East Section, Central Intelligence Group, 1946. (Typewritten.)
- 'Trust Territory Opened to Japanese Fishing,' *Honolulu Star Bulletin*, May 19, 1950.
- 'Trusteeship for Pacific Islands: United States Draft Agreement before the Security Council,' *United Nations Bulletin*, Vol. II (1947), pp. 224-226, 260-262, 283-286.
- Tsuboya, K. 'Petrographical Investigation of Some Volcanic Rocks from the South Sea Islands, Palau, Yap, and Saipan,' *Japanese Journal of Geology and Geography*, Vol. IX (1932), pp. 210-212.
- Uehara, Tetsusaburo. 'Land Problems in the South Sea Islands.' Translation of Chapter III, *A Study of the South Sea Islands Observed as a Colony*. Tokyo: South Seas Culture Association, 1940. (Typewritten, Pacific Science Board, Honolulu.)
- Umbgrove, J. H. F. 'Different Types of Island Arcs in the Pacific,' *Geographical Journal*, Vol. CVI (1945), pp. 198-209.
- _____. *The Pulse of the Earth*. The Hague: Martinus Nijhoff, 1947.
- United States Commercial Company. Research Section. 'Bibliography of Micronesia,' *Economic Survey of Micronesia*, Vol. XIX. Honolulu: U. S. Commercial Company, 1946.
- _____. 'Monthly Progress Reports for the Saipan District.' March 1, 1946 - November 30, 1947. Saipan: Office of the Civil Administrator. (Typewritten.)

United States Congress. Subcommittee of Pacific Bases of the Committee of Naval Affairs, House of Representatives. *Study of Pacific Bases. Seventy-Ninth Congress, First Session, Pursuant to H. Res. 154.* Washington: Government Printing Office, 1945.

_____. House Document 378, 80th Congress, First Session. *Trusteeship Agreement for the Territory of the Pacific Islands.* Washington: Government Printing Office, July 3, 1947.

United States Department of the Interior. Board of Geographic Names. 'Place Names in the Caroline, Marshall, and Mariana Islands (except Guam).' Decision List No. 4414. Washington: 1944. (Mimeographed.)

_____. *Japan's Big Fishing Companies.* Fishery Leaflet 268. Washington: Fish and Wildlife Service, 1947. (Mimeographed.)

United States Department of State. *Draft Trusteeship Agreement for the Japanese Mandated Islands.* With article by article explanatory comments. Publication 1784, Far Eastern Series No. 20. Washington: Government Printing Office, 1947.

_____. *The United States and Non-Self-Governing Territories.* Washington: Government Printing Office, 1947.

United States Navy Department. Naval Government of Guam. *The Island of Guam.* Washington: Government Printing Office, 1925.

_____. Hydrographic Office. *Pacific Islands Pilot*, Vol. I. H. O. No. 165. Washington: Government Printing Office, 1928.

_____. *Annual Reports of the Governor of Guam, 1900-1941.* Washington.

_____. Office of the Chief of Naval Operations. *Agriculture in the Japanese Mandated Islands.* Civil Affairs Guide, OPNAV22-17. Washington, 1944.

_____. Office of the Chief of Naval Operations. *Fishing Industry of the Japanese Mandated Islands.* OPNAV-P22-20. Washington, 1944.

_____. Office of the Chief of Naval Operations. *Fishing Regulations.* Civil Affairs Manual, OP13-19. Washington, 1944.

_____. Office of the Chief of Naval Operations. *Mandated Marianas Islands.* Civil Affairs Handbook, OPNAV-P22-8. Washington, 1944.

_____. Pacific Fleet and Pacific Ocean Areas. *Guide to the Western Pacific for the Use of the Army, Navy, and Marine Corps of the United States of America.* CINCPAL-CINCPDA Bulletin 126-44, 1944.

_____. Office of the Chief of Naval Operations. *The Sugar Industry of the Japanese Mandated Islands.* Civil Affairs Guide OPNAV-P22-103. Washington, 1944.

United States Navy Department. Pacific Fleet and Pacific Ocean Areas. *Climatology and Oceanography of the Western Pacific*. CINCPAC-CINCPAO Bulletin No. 1-45, 1945.

_____. Military Government, Saipan. *A Photographic Record of the Operation of Military Government on Saipan*. Saipan: Military Government Section, 1946.

_____. *Report on the Civil Governments of Guam and American Samoa*. By Secretary of the Navy James Forrestal's Special Civilian Committee. Washington, 1947. (Mimeographed.)

_____. Military Government, Saipan. *So This Is Saipan*. Information on Saipan prepared for military personnel. Saipan: Military Government Section, 1947. (Mimeographed.)

_____. *Information on Guam Transmitted by the United States to the Secretary-General of the United Nations*. Pursuant to Article 88 of the Charter, OPNAV-P22-100B. Washington, 1948.

_____. Office of the Chief of Naval Operations. *Handbook on the Trust Territory of the Pacific Islands*. Washington: Government Printing Office, 1948.

_____. *Information on the Trust Territory of the Pacific Islands under Naval Administration to October 1, 1948*. Washington, 1948.

_____. Trust Territory of the Pacific Islands. Civil Administration Unit, Saipan. *Admiral D. C. Ramsey's Visit to Saipan*. Information on the Saipan District prepared for Admiral Ramsey. Saipan: Civil Administration Office, 1948. (Mimeographed.)

_____. *Information on the Trust Territory of the Pacific Islands under Naval Administration to 1 November, 1949*. Washington, 1949.

_____. Hydrographic Office. Supplement to Hydrographic Office Publication 165. *Sailing Directions for Pacific Islands*, Vol. I. Washington: Government Printing Office, 1949.

United States Weather Bureau. Typhoon Tracks Supplement. *Southwestern North Pacific Ocean*. Washington: United States Weather Bureau, 1944.

Useem, John. 'The American Pattern of Military Government in Micronesia,' *American Journal of Sociology*, Vol. XLI (1945), pp. 93-102.

_____. 'Governing the Occupied Areas of the South Pacific,' *Applied Anthropology*, Vol. IV (Summer, 1945), pp. 1-10.

_____. 'The Changing Structure of a Micronesian Society,' *American Anthropologist*, Vol. XLVII (1945), pp. 567-588.

- Useem, John. 'Americans as Governors of Natives in the Pacific,' *Journal of Social Issues*, Vol. II (1946), pp. 39-49.
- _____. 'Social Reconstruction in Micronesia,' *Far Eastern Survey*, Vol. XV (1946), pp. 21-24.
- _____. 'Applied Anthropology in Micronesia,' *Applied Anthropology*, Vol. VI (Fall, 1947), pp. 1-14.
- _____. 'Human Resources of Micronesia,' *Far Eastern Survey*, Vol. XVII (1948), pp. 1-4.
- 'Uses of the Coconut Palm,' *Guam Recorder*, Vol. XIII (November, 1936), pp. 4-5, 30.
- Van Zandt, J. Parker. 'Aviation in the Postwar Pacific.' *American Council Paper No. 9*. New York: Institute of Pacific Relations, 1945. (Mimeographed.)
- Vanatta, Jack. *Guam, the Gem of Micronesia*. Orlando (Florida): Southland Printing Co., 1947.
- Vincent, John Carter and others. *America's Future in the Pacific*. New Brunswick: Rutgers University Press, 1947.
- 'Von den Marianen,' *Koloniale Zeitschrift*, Vol. L (1900), pp. 179-180.
- Voyage Round the World in His Majesty's Ship the Dolphin, Commanded by Byron*. London: J. Newberry and F. Newberry, 1767.
- 'Voyages of William Dampier,' *Guam Recorder*, Vol. I (1924), No. 3, pp. 3-5; No. 4, pp. 3-4; No. 5, pp. 3-4; No. 6, pp. 3-4.
- Wadati, Kiyoo. 'Deep Focus Earthquakes in Japan and Its Vicinity,' *Proceedings Sixth Pacific Science Congress*, Berkeley, 1939, Vol. I. Berkeley: University of California Press, 1940, pp. 139-147.
- Walter, Richard. *A Voyage Round the World, in the Years MDCCXL, I, II, III, IV, by George Anson, Esq.* London: John and Paul Knapton, 1748. Published under direction of George Lord Anson.
- _____. *Anson's Voyage Around the World*. Boston: Charles E. Lauriat, 1928.
- Wegener, Georg. *Deutschland in Stillen Ozean*. Leipzig: Velhagen and Klasing, 1903.
- Weir, Wilbert Walter. *Productive Soils*. Chicago: J. B. Lippincott, 1938.
- Weitzell, E. C. 'The Mariana, Caroline, and Marshall Islands,' *Scientific Monthly*, Vol. LXIII (1946), pp. 218-226.

- Weitzell, E. C. 'Resource Development in the Pacific Mandated Islands,' *Journal of Land and Public Utility Economics*, Vol. XXII (1946), pp. 199-212.
- Wells, Linton. 'Japan's Mandated Islands,' *American Mercury*, Vol. L (1940), pp. 194-197.
- Wentworth, Chester H. 'Factors in the Behavior of Ground Water in a Ghyben-Herzberg System,' *Pacific Science*, Vol. I (1947), pp. 172-184.
- Wentworth, Chester K. *Geology of the Pacific Equatorial Islands*. Occasional Papers, Vol. IX, No. 15. Bernice P. Bishop Museum. Honolulu: Bishop Museum Press, 1931.
- _____. 'Use and Conservation of Fresh Water on Small Oceanic Islands.' Pacific Science Board, Honolulu, 1948. (Mimeographed.)
- 'Whalers in Guam in 1850,' *Guam Recorder*, Vol. II (1925), June, pp. 102-103, 121; July-August, pp. 140-141; September, pp. 170-171.
- 'What is the Matter in Guam?' Agaña: Agricultural Promotion Committee of the Guam Chamber of Commerce, 1925.
- Wheeler, Joseph. *Brig. General Report on the Island of Guam*. Washington: Government Printing Office, 1900.
- Williams, John Z. 'Administration of the Natives of Saipan,' *Foreign Service Journal*, April, 1946, pp. 7-10.
- Williams, M. Y. 'Distribution of Life Around the Pacific,' *Proceedings of the Fifth Pacific Science Congress*, Victoria and Vancouver, 1933 Vol. IV. Toronto: University of Toronto Press, 1934.
- Wood, Gordon L. *The Pacific Basin*. Oxford: Clarendon Press, 1930.
- Wood-Jones, Frederic. 'Data on Skeletal Material in the Bishop Museum: Skulls from Guam.' Honolulu: Bernice P. Bishop Museum. (Manuscript.)
- Worden, William L. 'Notes on a Saipan Farm,' *Harper's Magazine*, Vol. CXC (1944), pp. 58-61.
- _____. 'Our Dubious New Empire,' *Saturday Evening Post*, Vol. CCXVII (March 17, 1945), pp. 9-11.
- Wright, Rear Adm. C. H. 'Let's Not Civilize These Happy People,' *Saturday Evening Post*, Vol. CCXIX (May 3, 1947), pp. 23, 149-150.
- _____. 'Trust Territory of the Pacific Islands,' *U. S. Naval Institute Proceedings*, Vol. LXXIV (1948), pp. 1333-1341.
- Wright, John Kirtland, and Platt, Elizabeth T. *Aids to Geographical Research*. American Geographical Society, Research Series No. 22. New York: Columbia University Press, 1947.

- Wroth, Laurence C. 'The Early Cartography of the Pacific,' *Papers of the Bibliographical Society of America*, Vol. XXXVIII (1944), pp. 87-268.
- Yabe, H., and Tayama, Risaburo. 'Depth of Atoll Lagoons in the South Sea Islands,' *Proceedings of the Imperial Academy, Tokyo*, Vol. XIII (1937), pp. 50-52.
- Yamashina, Yoshimaro. 'Notes on the Marianas Mallard,' *Pacific Science*, Vol. II (1948), pp. 121-123.
- Yanaihara, Tadao. *Pacific Islands under Japanese Mandate*. Institute of Pacific Relations. New York: Oxford University Press, 1940.
- Yawato, Ichiro. 'Ancient Relics from Alamagan of the Mariana Islands,' *Journal of the Anthropological Society of Tokyo*, Vol. LX (1940), pp. 353-359. Translation in possession of Edwin H. Bryan, Jr., Pacific Science Board, Honolulu.
- Yossii, Masatosi. 'Distribution of Igneous and Metamorphic Rocks in the South Sea Islands,' *Proceedings of the Imperial Academy, Tokyo*, Vol. XIII (1937), pp. 74-77.
- Yslas Marianas, 1a Seccion. Datos referentes a dicha Seccion que se remiten a la Comision Central de Manila para la Exposicion Hispano Filipina. Dec. 31, 1886, Agana. Library of Congress Manuscript Division, MSS, Ac 690 - No. 6.
- Yslas Marianas, 2a Seccion. Datos referentes a dicha Seccion que se remiten a la Comision Central de Manila para la Exposicion Hispano Filipina. Dec. 31, 1886, Agana. Library of Congress Manuscript Division, MSS, Ac 690 - No. 7.
- Yslas Marianas, 6a Seccion. Datos referentes a dicha Seccion que remiten a la Comision Central de Manila para la Exposicion Hispano Filipina. Dec. 31, 1886, Agana. Library of Congress Manuscript Division, MSS, Ac 690 - No. 8.